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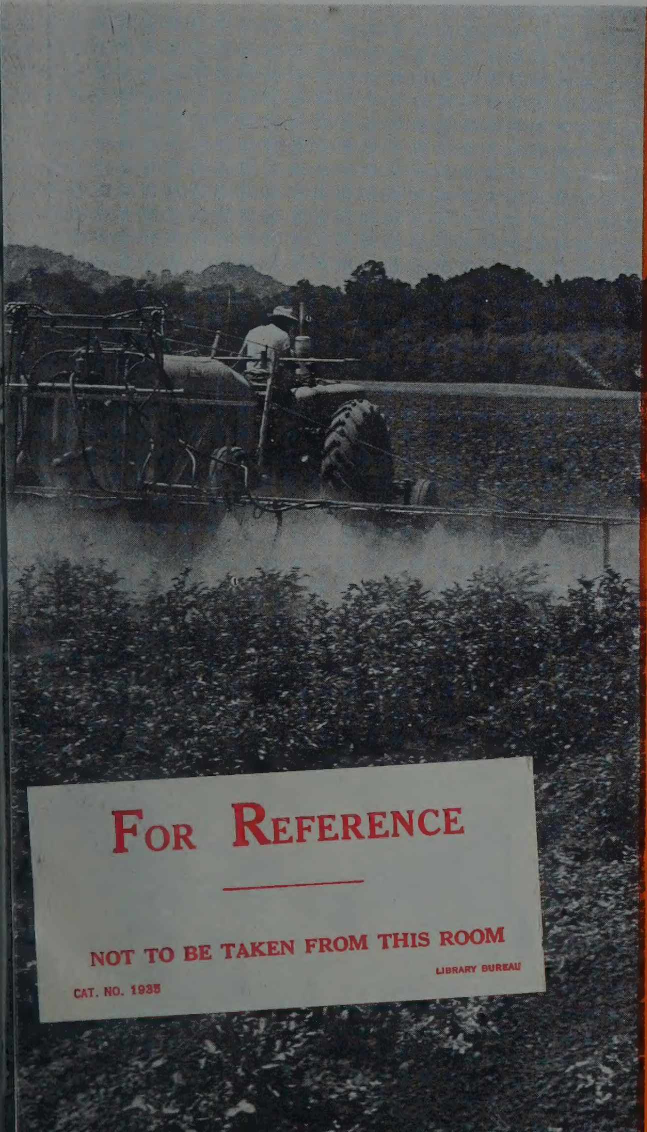

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In this issue:

Fertilizer Demonstrations
11-33-0 Production
The Pesticide Outlook
Pioneering Liquid Fertilizers
Home Garden Marketing
Granular Pesticides
Fertilizer Consumption Report
Improved Bagging Operation
Stabilization of Dry Pesticides
National ACS Meeting

CUSTOM APPLICATOR SECTION

May 1961

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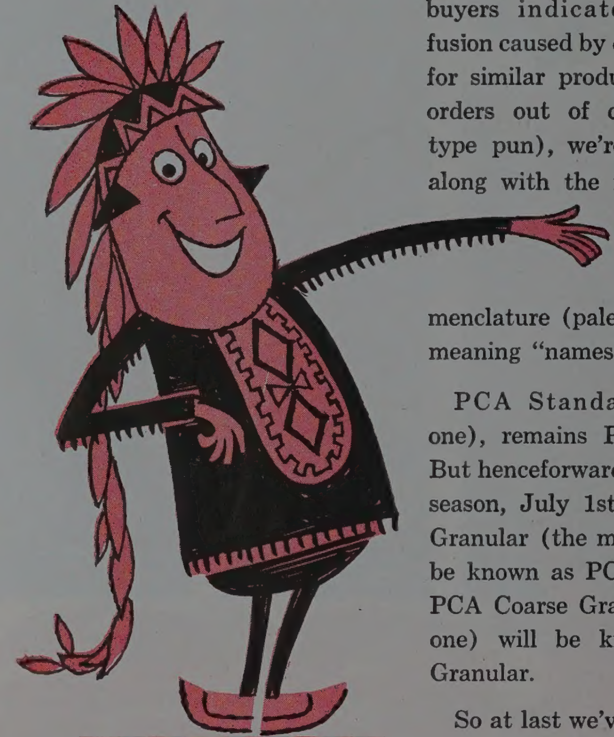

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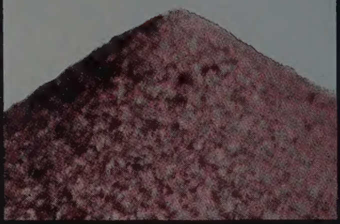

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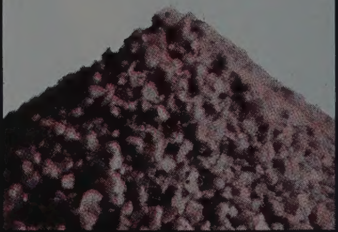

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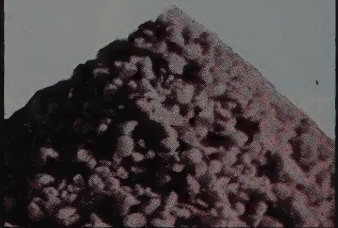

P.C.A.
The SALT of the EARTH
RED MURIATE

This Month's Cover

The increasing use of pesticides by farmers in the United States is reflected on this month's cover, which shows a pesticide spray being applied. The use of pesticides is expected to increase tenfold during the next 20 years, according to a representative of the pesticide industry. Page 19. Some of the reasons for this are outlined in the report of a farmer's experiences with herbicides. Page 34.

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AG CHEM

Vol. 16, No. 5 May, 1961

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PUBLISHED monthly on the 1st, by Industry Publications, Inc.

ADVERTISING and Editorial Office, P. O. Box 31, Caldwell, New Jersey.

PUBLICATION Office: 123 Market Pl., Baltimore, Md.

ENTERED as second-class matter November 4, 1949 at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

SUBSCRIPTION RATES: United States, 1 year, $4; 2 years, $7. Canada, 1 year, $5; 2 years, $9. Pan American countries, 1 year, $7; 2 years, $12. All other foreign countries, 1 year, $12; 2 years, $20.

SINGLE COPIES: current issue: $0.50; all back numbers $1.00. Postage and handling charges for foreign countries on single copies: $1.00. Claims for missing numbers will not be allowed if received more than 60 days from date of mailing. No claims allowed from subscribers arising from failure to notify the Circulation department of a change of address, or because a copy is "missing from files."

ADVERTISING RATES known on request. Closing date for copy—5th of month preceding month of issue.

INDUSTRY MEETING CALENDAR

May 17-18 — Chemical Market Research Association, 21st Annual Meeting, Plaza Hotel, New York.

June 5-7 — Southern Feed, Fertilizer, and Pesticide Control Officials, Annual Meeting, Lafayette Hotel, Lexington, Ky.

June 6-7 — Summer Meeting, Georgia Plant Food Educational Society, Wanderer Motel, Jekyll Island, Ga.

June 9-17 — European Congress of Chemical Engineers and ACHEMA Congress 1961, Frankfurt am Main, Germany.

June 11-14 — Annual convention, National Plant Food Institute, The Greenbrier, White Sulphur Springs, W. Va.

June 24 — Del-Mar-Va Peninsular Fertilizer Association, George Washington Hotel, Ocean City, Md.

June 27-29 — Twelfth Annual Fertilizer Conference of the Pacific Northwest, Marion Hotel, Salem, Oregon.

July 19-21 — Southwest Fertilizer Conference and Grade Hearing, Galvez Hotel, Galveston, Texas.

Aug. 7-9—Symposium on Pesticide Residues, 18th International Congress of Pure and Applied Chemistry, Montreal, Canada.

Aug. 27 - Sept. 1 — Annual Joint Meeting of Biological Societies, Purdue University, Lafayette, Ind.

Sep. 3-8 — 140th National Meeting, American Chemical Society, and National Chemical Exposition, Chicago.

Oct. 2-6—National Hardware Show, McCormick Place, Chicago.

Oct. 9-10 — Four-State Applicators & Chemical Conference, Chinook Motel and Tower, Yakima, Wash.

Oct. 9-11—Western Agricultural Chemicals Association, Annual Meeting, Hotel Claremont, Berkeley, Calif.

Oct. 20-22 — Eastern Lawn, Garden, and Allied Products Trade Show, Coliseum, New York.

Oct. 23-25 — Entomological Society of Canada, Entomological Society of Quebec, Joint Meeting, P.Q., Canada.

Oct. 29-Nov. 1 — National Agricultural Chemicals Association, 28th Annual Meeting, The Homestead, Hot Springs, Va.

Oct. 31-Nov. 2—National Fertilizer Solutions Association, Annual Convention, Edgewater Beach Hotel, Chicago.

Nov. 2-3 — Pacific Northwest Plant Food Association, annual convention, Hotel Gearhart, Gearhart, Oregon.

Nov. 6-7 — Annual Weed Conference, Washington State Weed Association, Chinook Motel and Tower, Yakima, Wash.

Nov. 7-10 — British Insecticide & Fungicide Conference, Brighton, England. Sponsored by Association of British Manufacturers of Agricultural Chemicals.

Nov. 8-10—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 12-14 — 38th Annual Convention of California Fertilizer Association, Jack Tar Hotel, San Francisco.

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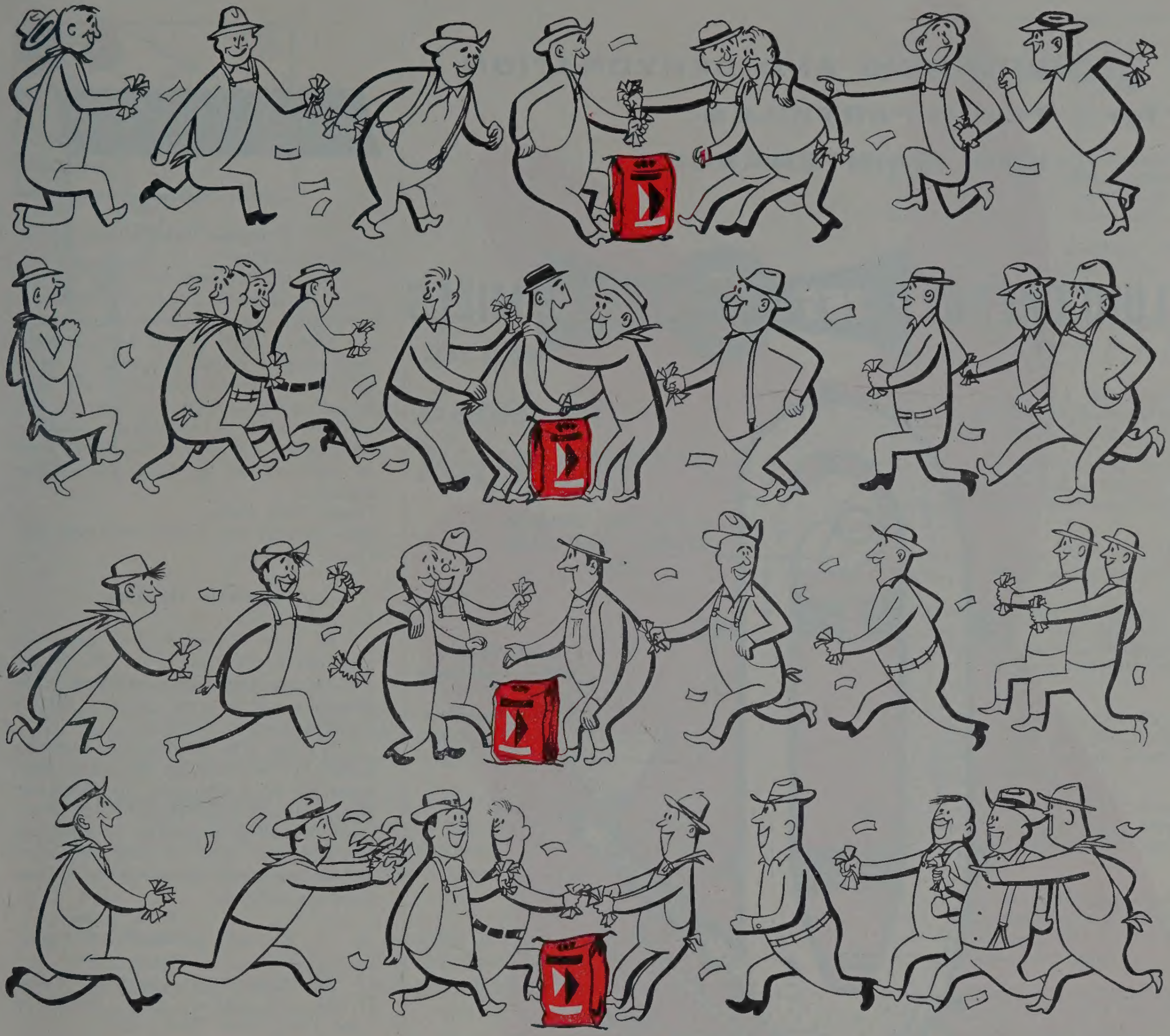
P-6



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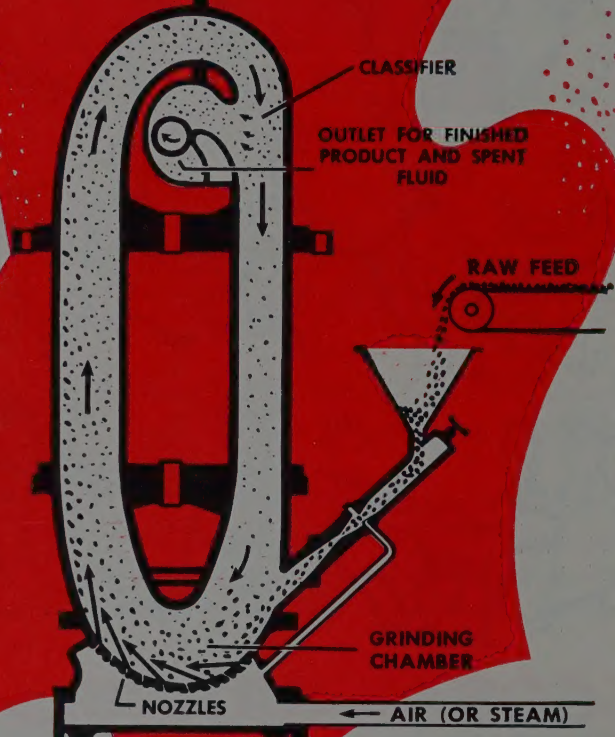

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LETTERS to the EDITOR

Valuable Publication

To The Editor:

Just a short letter to advise you how much we appreciate and value your fine publication. Our division managers in the field, as well as our administrative staff here at Hayti, Missouri, all agree that *Agricultural Chemicals* is the finest magazine of its type we know of, and certainly holds a tremendous wealth of information for our chemical sales force as well as our agricultural applicator segments.

Frank Dean Kelley
Mid-Continental Aerial Sprayers, Inc.
Hayti, Missouri.

Pesticide Dangers

To The Editor:

In your December, 1960 issue, on page 100, we read under the title "Pesticide Danger Doubted" a summary of the discussion on pesticide dangers, held in San Francisco on November 1st.

We are very interested in receiving a report of this meeting. But, as we don't know the exact address of the American Public Health Association in San Francisco, we allow ourselves to send you herewith our letter to this association and we beg you to be so kind as to complete this address.

B. Henrion
Pechiney Progil,
Paris

The address is: American Public Health Association, 1790 Broadway, New York, New York.—Ed.

Buyers Guide

To The Editor:

Since you publish the leading technical magazine in the field of agricultural chemicals, we thought that you would be able to let us know whether or not there is a buyer's guide on agricultural chemicals available at the present time. We certainly could use one in our Denver area for developing our Agricultural Chemicals Division.

Frank J. Kasik, Jr.
Van Waters & Rogers, Inc.
Denver, Colo.

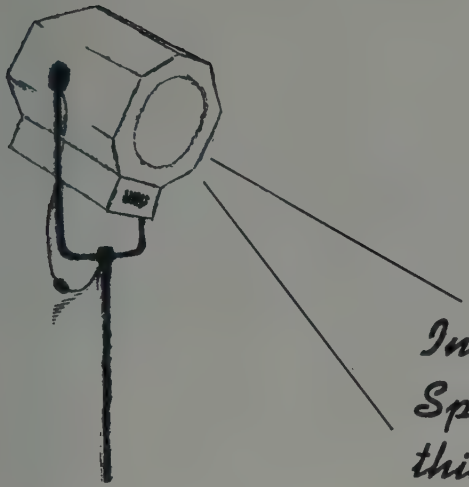
The annual "Agricultural Chemicals" Buyer's Guide will be published this year in our October issue.—Ed.

Copy Found

To The Editor:

We are very grateful for your thoughtfulness and diligence in searching for a copy of the July 1957 issue of *Agricultural Chemicals* for our library. Your promptness in inserting a classified ad for this issue is certainly appreciated.

J. D. Stubbs
Cornell University
Ithaca, N. Y.



In the Spotlight this Month

Fertilizer Demonstrations . . . A study conducted recently in Ohio indicates that farmers can be influenced to use more fertilizers through the use of fertilizer demonstration programs conducted cooperatively by industry, extension, and research workers. Page 14.

11-33-0 Production . . . Experimental plant production of 11-33-0 grade liquid fertilizer from superphosphoric acid and ammonia was started by the Tennessee Valley Authority in 1958. The plant is described and operating techniques and process control are discussed. Page 16.

The Pesticide Outlook . . . A pesticide industry official looks to the future for pesticides and predicts that pesticide use will rise by 20 per cent by the mid-1960's. During the next 20 years, he sees a tenfold increase. Page 19.

Pioneering Liquid Fertilizers . . . The use of field promotions, dealer programs, radio shows, and a complete inventory of application equipment has helped a Minnesota liquid fertilizer manufacturer to introduce liquids throughout its area. Page 23.

Home Garden Marketing . . . Sales personnel in garden supply stores must be prepared to offer acccurate and competent advice to their rapidly growing number of customers. To achieve this end, many dealers and distributors sponsor workshop courses for salesmen. Page 26.

Granular Pesticides . . . The tremendous growth in popularity of granular insecticides and herbicides has brought about a certain degree of confusion. An authority on granules discusses a number of problems which require research and consideration. Page 31.

Fertilizer Consumption . . . A preliminary report on the consumption of commercial fertilizers and primary plant nutrients in the United States for the year ended June 30, 1960. Total consumption was down slightly, but consumption of primary plant nutrients was up. Page 36.

Improved Bagging Operation . . . The factors of moisture and dust were responsible for periodic shut-downs of a Charleston, S. C., fertilizer plant's bagging machine for cleaning. Installation of new equipment and improved conveying systems has kept production levels up. Page 39.

Trade Listing

National Agricultural Chemicals Association, Association Building, 1145 19th St., N.W., Washington, D. C. Lea Hitchner, exec. sec.

National Plant Food Institute, 1700 K St., N.W., Washington, D. C. Paul Truitt, president.

American Potash Institute, 1102 16th St., N.W., Washington 6, D. C. H. B. Mann, president.

American Society of Agronomy, 2702 Monroe St., Madison, Wisc. Dr. Matthias Stelly, exec. sec.

American Phytopathological Society, S. E. A. McCallan, secretary. Boyce Thompson Institute, Yonkers, N. Y.

American Chemical Society, 1155 16th St., N. W., Washington, D. C.

Association of Official Agricultural Chemists, P. O. Box 540, Benjamin Franklin Station, Washington, D. C. William Horwitz, secretary-treasurer.

Agricultural Ammonia Institute, Hotel Claridge, Room 305, Memphis, Tenn. Jack Criswell, executive vice-president.

American Society of Agricultural Engineers, F. B. Lanham, secretary, 505 Pleasant St., St. Joseph, Mo.

Carolinas-Virginia Pesticide Formulators Association, 516 S. Salisbury St., Raleigh, N. C. Hugh Horn, secretary-treasurer.

California Fertilizer Association, Sidney Bierly, executive secretary, Room 213, Ochsner Building, 719 "K" Street, Sacramento, Calif.

Chemical Specialties Manufacturers Association, 50 East 41st St., New York City. Dr. H. W. Hamilton, secretary.

Entomological Society of America, 4603 Calvert Rd., College Park, Md. R. H. Nelson, secretary.

National Fertilizer Solutions Association, 2217 Tribune Tower, Chicago, Ill. M. F. Collie, secretary.

National Cotton Council, P. O. Box 9905, Memphis, Tenn.

Soil Science Society of America, 2702 Monroe St., Madison, Wisc. L. G. Monthey, exec. sec.

Sulphur Institute, 1725 K. St., N.W. Washington 6, D. C.
Dr. Russell Coleman, president.

Weed Society of America, W. C. Shaw, secretary, Field Crops Research Branch, Beltsville, Md.

Western Agricultural Chemicals Association. Charles Barnard, executive secretary, 2466 Kenwood Ave., San Jose, Calif.

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AG CHEM EDITORIALS

WHAT'S ahead in the insecticide market? Expanding sales, coupled with some definite changes in distribution patterns, say two men in prominent positions with leading producers of basic pesticides, who seem to be in an excellent position to know what to expect.

Wayne Yoder, of American Cyanamid, addressing the recent meeting of the Commercial Chemical Development Association, (see page 19 of this issue) makes a long run prediction for the next twenty years of a tenfold increase in pesticide volume. He anticipates that there will be fewer farmers in the future, but that the farms that survive will be larger and more efficiently run, and will make increasing use of all the aids to increased production,—more fertilizer, more pesticides, more cultivation and more care. For the short run—the 1961 season —he predicts heavy demand from the corn and cotton belts for insecticides, as a result of anticipated peak infestations of corn borers and boll weevils this year.

Coupled with a steadily growing use of pesticides by a smaller farm population, Mr. Yoder foresees changes in some of the established distributional patterns. Many farmers, he indicates, are re-examining their traditional purchasing policies, are by-passing the dealer and in some cases the formulator also. They are purchasing technical grades of pesticides and doing their own formulating. Although the overall market for pesticides is expanding, Mr. Yoder sees a declining role for the dealer in that larger market.

J. Paul Ekberg, of Monsanto, speaking before the Western Agricultural Chemicals Association recently (*Agricultural Chemicals*, April issue, pgs. 16-17) also feels that over the next ten years there will be some major changes in established channels of distribution. The basic producer, he feels, will always fill an essential role in the industry, and he sees the formulator's position as also "basically secure." He is by no means as certain about the future share in the industry of the conventional distributor, however, and predicts that he may be largely replaced in the future by a network of "super market" type farm supply stores.

The dealer has always, in our opinion, been the weak link in expanding the pesticide market. The typical busy dealer, enmeshed in the detail involved in handling a stock embracing hundreds of different items, has never had the time to really learn much about pesticides and, with but few exceptions, the basic producers have done very little to help him. If the pesticide industry is ever to approach its true potential, we agree that some major changes in the distribution pattern are an important prerequisite.

* * * * *

ELIMINATION of at least one phase of the preferential tax treatment that has been accorded to farm cooperatives is projected in President Kennedy's recent message to Congress outlining a program for changes in the tax laws. Congress has been asked to revise the present law so that co-op earnings would be immediately taxable in the year in which they are earned, either to patrons, if the earnings are distributed, or to the co-op itself.

There has been a big loophole in our tax laws, which the Kennedy proposal would eliminate, in that earnings allocated to patrons, but not actually paid to them, are taxable neither to the cooperative nor its customers. Commercial

(*Continued on Page 98*)

Ohio State Study Shows

Farmers Are Responsive To Fertilizer Demonstration Programs

Soil testing has been found to be a key step in securing a change in a farmer's use of fertilizer. Attitudes do not seem to affect fertilizer use for farmers who soil test; however there is a strong relationship between attitudes and use for those farmers who do not soil test. Soil testing, therefore, may be one method of "cancelling out" the influence of any negative attitudes toward fertilizer.

The chief anxieties of farmers regarding fertilizer use are; burning their crops, getting proper application, and obtaining the greatest returns from their fertilizer investment. Undoubtedly, more complete information about fertilizer on such topics as fertilizer placement and the elements of plant nutrition could help to neutralize many of these negative attitudes on the part of farmers.

THE effect fertilizer demonstrations have on changing the fertilizer use patterns of farmers is reflected in the 42 per cent increase in fertilizer use achieved in Miami County, Ohio, during 1960 as the result of a demonstration program on corn and meadow crops conducted during 1959 and 1960. The demonstration program was sponsored by the National Plant Food Institute in cooperation with the Ohio Agricultural Extension Service and Ohio State University's agricultural economics and rural sociology department, Columbus, Ohio.

The 42 per cent increase in use of fertilizers in Miami County during 1960 was way ahead of the 3 per cent increase for the state of Ohio as a whole. An 18 per cent rise was achieved in neighboring Champaign County, which had been selected as a check county for the program. The rise in Champaign County is attributed to the effects of the Miami county demonstrations spilling across county lines.

In connection with the fertilizer demonstrations, a survey was conducted to determine the nature of the diffusion process by which a fertilizer practice is communicated from farmer demonstrators to the surrounding farmer audiences. Research interviews were completed with a random sample of 86 commercial farmers in Miami County before the demonstrations of higher fertilizer applications began. Seventy-seven of the original audience sample were reinterveiwed after the demonstration program was completed.

This article is based on preliminary reports of studies conducted by Everett M. Rogers, assistant professor of rural sociology; Gordon Ryder, extension agronomist; and Frank O. Leuthold, assistant professor of rural sociology; all of Ohio State University, Columbus. The complete findings of the studies are to be published later this year by the university.

The major findings of the study are summarized in a preliminary report as follows:

1. Twenty-eight per cent of the audience (farmers not involved in the demonstration) first learned about the demonstration program by seeing a road sign, 22 per cent by talking with a demonstrator (farmer engaged in the program), and 19 per cent by reading about the program in a newspaper.
2. Demonstrators differed from the audience markedly in personal characteristics. Demonstrators were characterized by more opinion leadership, earlier adoption of farm innovations, more favorable attitudes toward fertilizer, more knowledge about fertilizer, more years of formal education, higher formal participation, less belief in agricultural magic, and higher social status.
3. The more effective demonstrators (who talked to more audience farmers) were higher in opinion leadership than the less effective, but did not differ significantly on other characteristics studied.
4. Demonstrators function as opinion leaders in the two-step flow of communication by which ideas flow from mass media to

local opinion leaders and then to the mass audience. Demonstrators use more cosmopolite information sources than the audience. Cosmopolite sources are those external to the community, such as bulletins, farm magazines, soil tests, and contacts with county agents. The Ohio State findings suggest a modification of the two-step flow hypothesis: that ideas flow from any relevant cosmopolite source to opinion leaders and from them by localite means to the mass audience.

5. The portion of the audience that personally communicated with demonstrators was characterized by more opinion leadership, more knowledge of fertilizer, higher social status, more years of education, more favorable attitudes toward fertilizer, earlier adoption of farm innovations, and more formal participation. Farmers reached by demonstrations, as is the case with most other educational methods, seem to need the help least.

6. Members of the audience tended to communicate personally with demonstrators in the same or earlier adopting categories, with a similar or higher social status, and with those who lived within an average of four miles. This is an example of the tendency for individuals to associate with others of similar attitudes and values, although the present findings on this point should be regarded as tentative because of the limited nature of the data.

Effect On Sales

Fertilizer sales figures for 1958-59 and 1959-60, the fertilizer demonstration years, show an increase of 31 per cent in use of nitrogen, 30 per cent for P_2O_5, and 33 per cent increase for K_2O in Miami county, for the fiscal year 1959, over the previous years, 1958-59. The increase in fertilizer use for the state of Ohio for the same period showed a 6 per cent increase in nitrogen, 8 per cent for P_2O_5, and 2 per cent for K_2O. The control county, Champaign County, registered increases of 21 per cent nitrogen, 24 per cent P_2O_5, and 14 per cent K_2O. Although these figures were regarded as surprising when first tabulated, the researchers now credit the amount of increase in Champaign County to its close proximity to the demonstration county. In summarizing the individual data from the various companies selling fertilizer goods in both counties, they found that four companies whose sales representatives were active in the Miami County demonstration program had Champaign as their primary area of operation. The fertilizer tonnage of these four companies increased tremendously in Champaign County for the year 1959-60 over the year 1958-59. In checking personally with the four demonstration surpervisors of these four companies, it was learned that they put into practice some of the things they had learned in Miami County in their sales programs in Champaign County. The tonnage reports of the other 19 companies selling fertilizer goods in Champaign County were almost identical for the two-year period. When the increased sales of these four companies that participated in Miami County demonstrations were deducted from the total increase, consumption in Champaign County was indicated to have increased only about 2 per cent above that for the state average.

Table I. Attitudinal Blocks to Higher Fertilizer Application

Blocks to Higher Applications	Per Cent of Respondents
Costs too much	44%
Think I use enough now	36
Landlord won't let me	7
Manure is better (or) fertilizer burns crops	6
I follow soil tests	4
I'm not equipped	3
Total	100%

Table II. Most Important Fertilizer Information Source

Information Source	Farmer Sample	Demonstrators
Dealers and salesmen	32%	13%
Farm magazines	23	21
County agent or bulletins	15	57
Neighbor and relatives	8	—
Other sources	22	9
Totals	100%	100%

The data gathered on farmers' attitudes toward fertilizer in the before-after studies is not entirely consistent with data secured from the fertilizer industry on actual fertilizer sales (although the two sets of data are not directly comparable). No significant increase in farmers' attitudes toward fertilizer was found as a result of the demonstration program, according to fertilizer sales figures.

Several reasons are suggested for this lack of shift in attitudes: Past sociological studies show that attitudes of any kind are very difficult to change, particularly over a relatively short time period. The change in attitudes might have been more significant if the follow-up study had been made a year after the completion of the demonstration program. In addition, it is possible for fertilizer use to change (as it evidently did) without a major change in attitudes.

The Ohio State scientists found evidence, for example, that soil testing is a key step in securing a change in farmer's use of fertilizer. Attitudes do not seem to affect fertilizer use for farmers who soil test; however, there is a strong relationship between attitudes and use for those farmers who do not soil test. This finding suggests that soil testing may be one method of "cancelling out" the influence of negative attitudes toward fertilizer.

A survey of the major attitudinal blocks to using higher fer-

(Continued on Page 96)

Producing 11-33-0 Grade Liquid Fertilizer From Superphosphoric Acid And Ammonia

For best results in the production of liquid fertilizer from superphosphoric acid, a heel of previously prepared liquid first should be charged to the reactor so that vigorous agitation can be established. This helps prevent hydrolysis and overammoniation.

The formulated amounts of ammonia, superphosphoric acid, and water then should be added simultaneously to maintain the desired pH. The water addition should be controlled so that the specific gravity of the liquid is about 1.324 at 180°F. for 11-33-0.

by W. C. Scott and J. A. Wilbanks
Tennessee Valley Authority
Wilson Dam, Alabama

SEVERAL years ago, TVA developed a process for the production of concentrated electric-furnace phosphoric acid containing about 76 per cent phosphorus pentoxide (*3*). This acid is a liquid at room temperature and contains about 70 per cent more phosphorus pentoxide per unit volume than the phosphoric acid in common use. About 50 per cent of the phosphate is in the form of polyphosphates. The use of this acid in pilot-plant studies of the production of liquid fertilizers has been reported (*4, 5*). By ammoniating the acid to a pH of about 6.3, a solution containing about 11 per cent nitrogen and 33 per cent P_2O_5 was obtained. This solution did not crystallize when stored for extended periods at room temperature or at 32° F. In comparison, an 8-24-0 is the highest grade of liquid fertilizer or 1:3 $N:P_2O_5$ ratio that can be produced from ordinary phosphoric acid (54% P_2O_5), and will store satisfactorily under the same conditions. The higher analysis product made with superphosphoric acid results from the presence of polyphosphates, which are more soluble than orthophosphates. The previous work also showed that the superphosphoric acid and the 11-33-0 ammoniated superphosphoric acid can be used to produce high analysis liquid fertilizers containing all three major plant foods

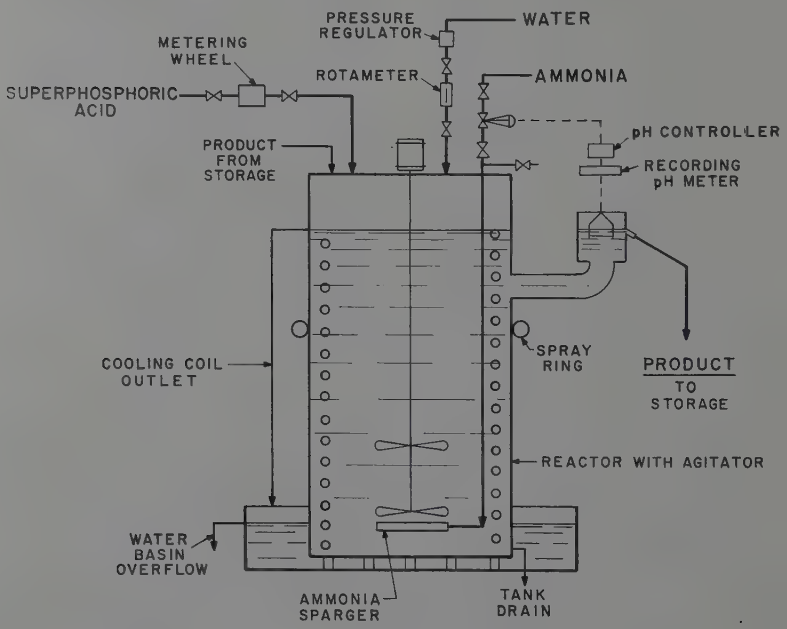

FIGURE I
UNIT FOR THE PRODUCTION OF 11-33-0 LIQUID FERTILIZER

Presented at the 138th national meeting of the American Chemical Society in New York.

(nitrogen, phosphate, and potash) (*4*). Also, they can be used with impure wet-process phosphoric acid to produce clear liquid fertilizers (*5*). In addition to these advantages, the superphosphoric acid or its ammoniated product (11-33-0) should be of considerable interest to the fertilizer industry because of the savings in storage space and also the savings in shipping and distribution cost.

In order to introduce the high-analysis liquid fertilizer in its test and demonstration program, TVA designed and constructed a production unit of about 2.5 tons per hour capacity at its fertilizer research and development center at Wilson Dam, Alabama.

In addition to supplying 11-33-0 liquid as a base solution in the preparation of various grades of liquid fertilizers for field tests, limited quantities of the base solution and of superphosphoric acid have been made available to liquid fertilizer manufacturers. Consideration is being given to changing the grade of the product from a nominal 11-33-0 to a 10-34-0. The latter grade has better storage properties at low temperatures because of a combination of maximum solubility and good supercooling properties.

Table I. Data on Plant-Scale Production of 11-33-0 Liquid Fertilizer

Test No.	1	2	3
Operating time, hr.	5.5	1.0	3.9
Raw materials feed rate, lb./hr.			
Superphosphoric acid[a]	3525	2420	4360
Ammonia[b]			
(Liquid	—	—	1278
(Gaseous	997	728	—
Dilution water	3150	2352	4012
Average production rate, tons/hr.	3.8	2.8	4.8
Product temperature, °F.	187	195	177
pH	6.2	6.4	6.3
Specific gravity	1.345	1.340	1.342
Chemical analysis, % by weight			
Superphosphoric acid			
Total P_2O_5	77.2	77.1	75.2
Ortho P_2O_5	34.2	38.5	44.2
Ortho P_2O_5, % of total P_2O_5	44.3	49.9	58.7
Product			
Nitrogen	10.7	10.9	10.9
Total P_2O_5	34.7	33.9	34.0
Ortho P_2O_5	16.2	17.0	20.2
Ortho P_2O_5, % of total P_2O_5	46.7	50.2	59.4
Cooling water temperature, °F.			
Inlet	60	84	67
Outlet	157	158	124
Heat removed by cooling water from reaction vessel, Btu/lb. P_2O_5	812	800	603

[a] Superphosphoric acid was fed at average temperatures of 181°, 170°, and 168° F., respectively, in the tests.

[b] Ammonia was fed at about 70° F. in tests 1 and 3 and about 85° F. in test 2.

Description and Operation

The production unit is very simple and is operated continuously. It consists of a flat-bottom tank (reactor), 38 inches in diameter and 72 inches high, which is equipped with an agitator and an internal cooling coil. The agitator consists of two 12-inch-diameter arrowhead turbine blades mounted on a common shaft, which is driven at about 200 revolutions per minute with a 3-horsepower motor. The cooling coil consists of approximately 187 linear feet of $1\frac{1}{2}$-inch pipe arranged as a helical coil of twenty-two turns having a diameter of 32 inches (center to center). In addition to removing heat from the reactor by pumping water through the coil, some heat is removed by spraying water on the shell of the reactor. The reactor has an effective volume of about 230 gallons.

Although the reactor shell and agitator shaft and blades were fabricated from stainless steel, mild steel would have been suitable, as shown in laboratory tests and in tests of specimens in plant reactors. The stainless steel equipment was used because it was already on hand. Although the internal coil, which was fabricated from black iron pipe, failed and had to be replaced after about 2 years, the failure was caused by wear from vibration against the coil spacers rather than from corrosion.

In laboratory corrosion tests of mild steel specimens submerged in aerated 11-33-0 liquid (pH, 6.2) at a temperature of 180° F., the corrosion rate was 7 mils per year. The corrosion rate of mild steel specimens also was tested in a reaction vessel of a typical commercial liquid fertilizer plant in which superphosphoric acid was used to produce several grades of liquid fertilizers including several grades containing potash; the corrosion rate was about 12 mils per year.

The only stainless steel actually required in this plant is the acid-handling equipment. Figure 1 is a simplified flowsheet of the plant.

At the beginning of a run, a heel of 11-33-0 grade liquid is put in the reactor so that the incoming materials will be in the effective area of the agitators; this helps prevent hydrolysis and localized overammoniation, which would result in the formation of diammonium phosphate crystals. The super-

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The authors wish to acknowledge the assistance of many members of the technical and operating staff of the Office of Agricultural and Chemical Development.

phosphoric acid, anhydrous gaseous or liquid ammonia, and water are fed continuously and simultaneously to the reactor, and the product flows continuously from the reactor through an outlet near the top of the surge tank from which it is pumped intermittently to storage. The superphosphoric acid is heated to 125° to 185° F. to lower its viscosity and thereby facilitate pumping and metering. It is metered by means of a metering wheel and flows into the top of the reactor. The flow of ammonia is regulated automatically with a recording pH controller. The ammonia is released through a sparger located about 6 inches above the bottom of the reactor. Water is metered with a rotameter and flows into the top of the reactor on the side opposite the superphosphoric acid. The water must be kept away from the acid until after ammoniation to avoid hydrolysis of some of the polyphosphates to orthophosphates.

The concentration of the product is determined by measuring its specific gravity and is adjusted by changing the amount of water added. The specific gravity of the product is about 1.342 at 180° F. or about 1.365 at 75° F. Usually about 5 per cent in excess of the formulated amount of water is required to compensate for vapor losses. The temperature of the liquid in the reactor is controlled in the range of about 180° to 195° F. by adjusting the flow of water through the cooling coil.

The proportions of acid and ammonia are fixed so as to maintain an approximately neutral solution (pH, 6.0 to 6.3). At a pH above 6.3 the product is likely to salt out in cool weather. The following tabulation shows the lowest temperatures at which solutions of different pH's and containing about 48 per cent of the total P_2O_5 in the polyphosphate form were stored for long periods without salting out.

	Per cent by weight			
pH	N	P_2O_5	$N:P_2O_5$ weight ratio	Minimum safe storage temperature, °F.
6.0	10.0	33.6	0.297	0
6.1	10.2	33.3	0.306	0
6.2	10.5	33.4	0.314	0
6.3	10.7	33.2	0.322	0
6.4	10.9	33.1	0.329	60
6.5	10.9	33.2	0.328	60
6.6	11.1	33.0	0.336	85
6.7	11.2	32.9	0.340	85
6.8	11.3	33.3	0.341	90
6.9	11.6	33.4	0.347	100
7.0	11.9	33.2	0.358	110

Gaseous vs. Liquid NH_3

During the first 2 years of operation, the superphosphoric acid was neutralized with gaseous ammonia because it was already available at the plant site and the capacity to produce liquid fertilizer was not an important consideration. No difficulties were encountered. The production rate was limited by the cooling capacity and ranged from about 2.5 tons per hour with cooling water at 85° F. to about 4 tons per hour with cooling water at 60° F. However, by neutralizing the acid with anhydrous liquid ammonia, which has a cooling effect when it vaporizes, the production rate later was increased by a factor of 1.3. When anhydrous liquid ammonia was used, it was necessary to remove about 600 Btu per pound of P_2O_5 with cooling water to maintain a temperature of 180° to 195° F. whereas, with gaseous ammonia, it was necessary to remove 800 Btu. Calculations indicate that an additional increase in capacity of about the same magnitude could be obtained by using aqua ammonia for neutralization; the heat to be removed with cooling water would be about 450 Btu per pound of P_2O_5. The form of ammonia used for neutralization of the acid had no effect on the quality of the product as long as agitation during neutralization was sufficient to prevent localized overammoniation. In a few instances when overammoniation occurred, some diammonium phosphate crystallized in the reactor. The crystals dissolved readily, however, when feeding of the reactants was discontinued and the product was allowed to stand for a few minutes. Results of typical plant tests in which anhydrous gaseous and liquid ammonia were used for neutralization of the acid are shown in Table I.

Hydrolysis of Polyphosphate

Earlier work (*4*) showed that little hydrolysis of the polyphosphates in superphosphoric acid occurred during the production of liquid fertilizers if the acid was not mixed with water before ammoniation. The data in Table I shows that, at operating temperatures of about 180° to 195° F., hydrolysis of polyphosphates amounted to only 0.3 to 2.4 percentage points, which is not considered significant.

The 11-33-0 grade liquid will hydrolyze slowly during storage. The degree depends on the temperature and length of storage. In laboratory tests, no appreciable hydrolysis occurred in 4 months at 32° F. About 5 per cent of the polyphosphate hydrolyzed in 4 months at 80° F., about 13 per cent hydrolyzed in 2 weeks at 120° F., and about 70 per cent hydrolyzed in 2 weeks at 150° F. These data indicate that hot weather storage for prolonged periods should be avoided. Liquid that has been stored during the summer should not be continued in storage through the winter. With the decrease in polyphosphate content

(*Continued on Page* 93)

Agronomically, the P_2O_5 in liquid fertilizers made from superphosphoric acid is at least as effective as that in concentrated superphosphate and other water-soluble liquid fertilizers.

The Pesticide Outlook

Counts of overwintering insects are among the many important factors affecting pesticide manufacturers in planning production schedules. Reports from federal and state entomologists this year, for instance, indicate that there will be large corn borer and boll weevil infestations this season and this means that there will be a good market for insecticides in the corn and cotton belts.

by Wayne Yoder

Pesticide Products Manager
American Cyanamid Company

THE pesticide business is an important segment of the chemical industry. In 1960, at the basic manufacturer's level, the business amounted to 290 million dollars. It involved fifty basic manufacturers and about five hundred formulators operating regionally and nationally. Although in most cases pesticides produced by the formulators are marketed through distributors to the ultimate consumers, this practice shows definite signs of changing. In some areas, the insecticide formulator is selling direct to the consumer.

There are at least eight outside factors that affect the pesticide business and which have a bearing on sales and production. Weather affects the outlook in many ways. Besides its direct effect on crops, it affects the enemies of the crops—the insects, the diseases, and the weeds. A warm dry season will produce a heavy attack of insects, much less infection by diseases, and a light crop of weeds. A cool wet season, however, will have opposite results. This was the case in 1960 when overall insecticide sales dropped, compared with sales of fungicides and herbicides. Herbicide sales in 1960 jumped seven per cent over 1959.

Counts of overwintering insects are extremely important to pesticide manufacturers in planning production schedules. Reports from federal and state entomologists this year, for instance, indicate that there will be large corn borer and boll weevil infestations this season and this means that there will be a good market for insecticides in the corn and cotton belts.

Despite the general concern about the farm income problem, most farmers seem to be making money. Greatly increased incomes in 1960 over 1959 have been reported from such states as New Jersey, Iowa, Maine, and Massachusetts. In addition, the Department of Agriculture estimates that 1961 income will run 5 or 6 per cent higher than 1960.

Another favorable sign facing the pesticide industry is the prediction that there will be 80 million more people in the United States by 1980. This means that there will be more people eating and wearing clothes. Also, the non-farm market for pesticides can be expected to grow accordingly. It already has been credited with 15 per cent of all the dollars spent on pesticides in the United States.

During the next 20 years, the pesticide business will increase tenfold, because only by increasing its use of pesticides can agriculture continue to increase its productive capacity to meet the demands and needs of consumers in an expanding population.

From a talk presented before the Commercial Chemical Development Association, March 16, in New York.

In spite of the general population increase, the farm population today is down to what it was during the Civil War. This is a sign of efficiency on the farm—and pesticides are an important part of that efficiency. Despite the constant drift of the farm population away from the farm, the pesticide industry is not losing its market. This is because the good, successful farmers are not leaving the farm. The farmer who decides to give up generally is not operating a successful or efficient farm. Usually, however, he sells his farm to his successful neighbor who adds it to what he has and expands his operation.

This is the trend all over. The pesticide industry is selling more pesticides to fewer farmers who

(*Continued on Page* 90)

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Part II of Special Report

Nitrogen Industry-Water Transport Reviewed At National ACS Meeting

Increased opportunity for moving fertilizers by water is seen in shipment of phosphate materials from Florida to midwestern farm belt.

"THE most promising opportunity for increased water movement of fertilizers lies in the shipment of phosphate materials from Florida to the midwestern farm belt," Odin Wilhelmy Jr. told the 139th meeting of the American Chemical Society at St. Louis, March 21-31, in reviewing a study conducted in 1959 by Battelle Memorial Institute for the Mississippi Valley Barge Line Company. He said that information gathered in personal interviews with 28 fertilizer manufacturers throughout the eastern half of the United States revealed that virtually no domestically-produced potash or mixed fertilizers are likely to move by water to domestic consumers in the foreseeable future. Among nitrogen fertilizers, limited shipments of urea and nonpressure nitrogen solutions appear to be the only likely prospects for inland waterway movements, Mr. Wilhelmy said.

There is an additional opportunity for water shipment of phosphates, other than rock and triple superphosphate, that should not be ignored. This is the movement of ammophos materials from Florida, Texas, or Mississippi, plants to midwestern markets. At the moment, production and use of ammonium phosphates in areas amenable to water shipments is relatively small, but the volume is increasing, he pointed out.

In connection with phosphate rock and its derivatives, Mr. Wilhelmy said that a significant tonnage is shipped from Florida to major consuming areas. The proportion of these materials that is being moved, or could be moved, by water to the four central census regions (East and West North Central, and East and West South Central) is substantial. Florida, now producing over 70 per cent of domestic phosphate rock, is and will remain the principal source of fertilizer phosphorus in the United States in the foreseeable future.

The four central census regions combined are by far the largest market for these Florida-produced phosphates and are likely to remain so in the years ahead. At present, these regions consume over 60% of the fertilizer phosphorus used in the U.S. Among phosphate materials applied directly to the soil, these regions account for more than 95 per cent of the ground rock, half of the normal superphosphate, 2/3 of the triple superphosphate, and 60% of other phosphate fertilizers. In the same area are concentrated a major share of the nation's superphosphate plants, as well as hundreds of plants making mixed fertilizers that contain a phosphate material as a prime ingredient.

Mr. Wilhelmy said that the removal of certain obstacles and the adoption of certain practices would contribute toward more effective use of water transport. He recommended the following:

1) Development of an economic procedure and facilities for moving ground phosphate rock by water.
2) Alternatively, establishment of grinding facilities for phosphate rock at selected points in market areas.
3) Establishment of terminal storage facilities at selected points in market areas.
4) Development of better and more economic handling and loading materials for fertilizer grade ingredients.
5) Establishment of more joint barge-truck or barge-rail arrangements to facilitate shipments to plants not located on navigable waterways.

Mr. Wilhelmy observed that far-sighted companies already are giving considerable attention to these problems. Their ultimate solution will require still further advances in both the technology and economics of fertilizer transportation and distribution.

Competition has continued to increase in the nitrogen industry over the past fifteen years in the face of earlier predictions that the postwar period would see just the reverse occur.

IN discussing the modern structure of the nitrogen industry, and growth of competition in this industry, A. E. Abrahams, Oregon State College, pointed out that a major change has occurred during the period 1940 through 1958. Where once eight firms had constituted the industry, now 39 firms

(Continued on Page 89)

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Crookston Liquid Fertilizer, Inc.

Field Promotions, Dealer Program Help Introduce Liquid Fertilizer

An indication of the acceptance of liquid fertilizers by farmers in the Crookston, Minn., area can be found in the sales figures of the manufacturer's 14 dealer outlets. One dealer, for example, reports that his liquid sales have increased in two years from ten per cent to 50 per cent of his total fertilizer sales.

THE northernmost liquid fertilizer plant in the United States was built in 1958 in Crookston, Minnesota, at a time when liquids were unknown in that area, one of the state's best markets for fertilizers. Crookston, the county seat of Polk County, is in the heart of Minnesota's Red River Valley, where the deep, black prairie soils are ideal for beets, potatoes, and wheat. The more than 30,000 tons of fertilizers used in Polk County last year represents about 8 per cent of the state's total.

In 1957, however, farmers in that part of the country were unfamiliar with complete liquid plant foods, and dry fertilizers were used almost exclusively. Crookston Liquid Fertilizer, Inc., was formed by Thomas O. Cochrane, a former salesman for dry fertilizers, and William Strickler, a local farmer. Much of the capital was provided by local farmers.

The bulk of the liquid fertilizer used in the area goes on small grains. Crookston Liquid Fertilizer maintains a complete inventory of application equipment for farmers and dealers, including storage tanks. Much of the company's fertilizer production is applied on a custom basis by an independent contractor with whom the company has a working arrangement. The applicator, Vernon Hawkins, operates two trucks. Last year he covered some 17,000 acres, at an average of 20 acres per hour. He charges 60 cents per acre.

Formulas shown on the company's current price list include 9-9-9, 6-18-6, 8-16-8, 8-24-0, 10-20-0, 15-15-0, 12-12-6, 18-9-0, and 0-54-0. Among the largest sellers are 15-15-0 and 18-9-0. Quite a good business is done with the direct application of 0-54-0 and a straight nitrogen solution for fall plow down also is very popular. Speaking of this, Mr. Cochrane says, "Uran has been a real door opener for selling our complete solutions. Application is quite easy and results are very obvious." He adds that field and promotion efforts by his chemical supplier have been extremely helpful.

"We are dealing with progressive farmers who are willing to be shown," Mr. Cochrane comments. "They follow our test plot work, university studies, and so on, and also are keenly interested in the results obtained by their fellow farmers. Part of our sales job, of course, is to see that this information gets around. Right now, most of our customers are putting on 30 to 40 pounds of nitrogen at plowdown, then following along with the necessary formula at seeding time. We are using the results of both experimental and practical work to show them the advantages of putting more nitrogen in their starter fertilizers, and our steady growth indicates that this is the right way to sell."

The equipment installed by Crookston Liquid Fertilizer incudes a B&L Autobatch, a liqualizer, and a converter — all package components designed to be operated separately or together. They were supplied by Barnard & Leas Manufacturing Co., Cedar Rapids, Iowa, a firm with long experience in the agricultural field.

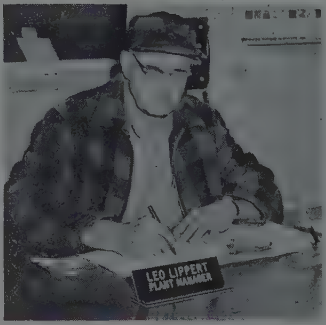
Mr. Cochrane reports that his company is highly satisfied with this type of equipment, which combines meter controls and automation with a highly effective combination of jet and pump agitation. The system, he says, makes possible instantaneous neutralization of acid and ammonia (thus preventing corrosion and vapor loss), and provides thorough and accurate blending. In operation, formulas are pre-set on the Autobatch panel and a single starter button is pushed.

The B&L Convertor employed at Crookston serves a dual purpose. It is used for changing anhydrous to aqua ammonia under controlled conditions, and it also is used as a cooler to speed capacity when high analysis formulas are made in the mixing operation.

Capacity for complete analysis fertilizers is from 15 to 20 tons per hour, depending upon formulation. Since the bulk of the liquid is produced and applied in a relatively short period of time (six weeks to two months), ample hourly capacity is important. Work days are long when the season is at its peak, and the Crookston equipment works almost around the clock during this period.

Operation on a high-capacity basis for two months easily would produce 10,000 tons of finished product, Mr. Cochrane states. Tonnage requirements have not reached that level yet, but they are doubling each year. Mr. Cochrane looks to the future with optimism pointing out that none of his customers has removed a liquid attachment from his equipment.

Thomas O. Cochrane (left), manager of the company, keeps the story of liquid fertilizers before the farmer with a daily program over Crookston's radio station.



Actual operation of the Barnard & Leas equipment in the plant is under the direction of Leo Lippert (right), plant manager. The company also maintains application equipment.

At the beginning, Crookston Liquid Fertilizers got off to a sound start by setting up a chain of dealers. Today, there are 14 dealer outlets made up of firms established in the farm supply business, such as grain elevators and dry fertilizer dealers. Each dealer has storage capacity for from 17,000 to 50,000 gallons of Fert-I-Flow (the company's trade name) and through this dealer organization, Crookston has developed markets within a 150-mile radius of its plant. An indication of the acceptance of liquid fertilizers in this area can be found in the sales figures of these dealers. In two years, for example, one dealer reports that his liquid sales have increased from 10 to 50 per cent of his total fertilizer sales.

Officials of the Crookston company feel that starting out with a strong dealer program was an essential factor in the rapid development of the business. They anticipate continued expansion of sales through dealers, but, at the same time, feel that an even greater growth may come in their own local market. Tonnage today is divided, with 60 per cent being sold through dealers and 40 per cent being sold locally. "With tonnage constantly going up," Mr. Cochrane comments, "we expect that this ratio will change so that perhaps 70 per cent of our output will be distributed locally. We realize that our local market, tied in with the service we can offer, is our best insurance for holding the lead in the liquid fertilizer business in our part of the country.

"We will continue to expand in every way, but much of the emphasis in our thinking is on how we can provide the finest in fertilizer know-how and facilities to farmers right in our own county," Mr. Cochrane feels.

Mr. Cochrane's principal interest is in management, (Mr. Strickler is president of the company) and in the development of business not only through direct selling, but also through dealer and farmer meetings that often are conducted in co-operation with his suppliers' salesmen. Actual operation of the equipment in the plant is under the direction of Leo Lippert, plant manager. Mr. Lippert's background includes service engineering work with a farm implement manufacturer.

Among the company's activities in getting the liquid fertilizer story before the farmer is the sponsorship of a daily morning radio

(*Continued on Page* 93)

TODAY'S
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Home Garden Marketing Requires Qualified Dealers

It is nothing more than standard selling practice that a garden supply salesman should endeavor to send his customer away with a complete supply of fertilizers, pesticides, and tools in addition to the grass seed that originally brought the customer into the store. Sales personnel, however, have an obligation to their employer and to their customers to provide sound advice and accurate answers to customers' questions about agricultural chemicals.

THE unprecedented increase in the number of home owners in the United States since the end of World War II has brought with it a corresponding increase in the garden supply business. What had been small roadside lathe houses dealing with occasional visitors, now must be super markets to gardeners, offering everything from seeds to tools.

In addition to merchandise, and, perhaps, equally important, garden supply stores must be prepared to offer accurate and competent advice to customers, many of whom are visiting the store with nothing more definite in mind than the purchase of a package of grass seed. It is nothing more than standard selling practice that the salesman should endeavor to send the customer away with a complete supply of fertilizers, pesticides, and tools, as well as the grass seed. In the words of sales instructors, sales personnel must "upgrade their selling techniques by gaining the attention of the customer, arousing his interest, and creating a desire." If this is to be done effectively, however, and if the customer is expected to return for future purchases, sales personnel have an obligation to their employer and to the customer to provide sound advice and accurate answers to customers' questions.

With this in mind, it has become a practice of many distributors of garden supplies to sponsor workshop courses for garden supply salesmen from department stores, garden centers, nurseries, and seed and hardware stores. In one such course, conducted by the Richmond Power Equipment Co., Richmond, Va. distributor of garden supplies and equipment, salesmen are put to work pruning roses, sowing grass seed, spraying shrubs, and tending lawns, in plots illuminated by floodlights. The class meets one night a month throughout the year, except in December, taking up problems the home gardener will encounter in coming months. The theory behind such training schemes, of course, is that, if a garden fails, the gardener becomes discouraged and buys no more garden supplies.

Other important factors to be considered by retail dealers are those associated with standard good-merchandising practices. These would include a carefully-selected store location, effective arrangement of shelves and other interior displays, utilization of displays that fit the season and tie in with advertising, planned and considered advertising, and a good product line. In carrying out these steps, garden supply dealers are tending more and more to depend upon their suppliers for assistance. In offering this assistance, in the form of such promotional efforts as tie-in advertising, display racks, and clerk training, many large chemical concerns that manufacture basic agricultural chemicals are becoming closely associated with garden chemicals in the minds of consumers.

This, among other considerations, has led to a shift in sales emphasis by many large companies who now offer their own trademarked products through retail outlets. One such concern is the Dow Chemical Co., Midland, Mich., which now markets its line of 70 agricultural pesticides through approximately 10,000 dealers. Dow's efforts to aid its dealer group to sell more of the Dow pesticides have been built around a program of cooperative advertising in local newspapers, paid for by Dow, carrying the name of the dealer and timed by him for maximum influence on his local market. The program is reported to have helped materially in increasing sales of Dow agricultural pesticides from $30 million to $45 million annually between 1955 and 1959. Before 1950, Dow sold most of its agricultural percentage through formulators to chemicals in bulk, a substantial be marketed under private brands.

Another large company that is devoting more and more of its attention to its home garden line is the Ortho Division of California Chemical Co., formerly California Spray-Chemical Corp. The market for the Ortho line is made up of the 25 million single family, owner-occupied homes throughout the United States. Sales primarily are through self-selection and clerk-manned outlets at garden shops, supermarkets, nurseries, and hardware establishments.

Geographical variations require differences in chemical formulations for many items. For the east there are 50 products in the Ortho line; for the west, 55. Some products, such as Ortho lawn and garden food, are sold only in the west.

Although headquartered in Richmond, Calif., Ortho maintains additional plants for packaging home garden products at St. Louis, South Plainfield, N. J., and Orlando, Fla. The seasonal nature of the agricultural chemicals business works to an advantage in relation to small package filling. Year around sales would require many more packaging lines than Ortho now employs. Ortho begins the packaging of next year's products in August and undertakes its active distribution campaign to dealers in September. By evaluating past sales figures and future projections, an effort is made not to produce an over-supply of a particular product. With the long packaging cycle which the seasonal lull permits, most low-volume products can be prepared early, leaving the packaging equipment free during the peak sales months to take care of un-anticipated demand for the faster-selling items, such as the rose dust puffer which averages a million a year.

Ortho officials have given considerable attention to integrating the over-all product line to achieve a strong family design resemblance. Similar study has been devoted to displays. Many of the corrugated shipping containers are colorfully printed on the inside as well as on the outside. After the case is opened, the flaps can be folded down to form an attractive counter merchandising unit.

The tie-in of household items with household names, such as Louis Nye, popular television comedian, plays a large part in arousing and maintaining the interest of home gardeners. It must be properly timed and planned, however, to be successful. In addition, it must be consistent. One-shot ads do not result in a long-range profit.

Ortho feels that a successful marketing program for small package agricultural chemicals demands—in addition to a good line of products—a complete line, so that the dealer will not need to order from a series of companies and yet can offer a "one-stop" service where his customers can buy all the agricultural chemicals products they require. Another practice followed by Ortho is the placing of a limit on the number of distributors of Ortho products. If there are too many distributors, it is felt that the franchises will have lowered value. It is better practice, they feel, to line up a select group of distributors who will actively push a line on which they and their dealers can make sales—and profits.

The fourth point in Ortho's successful marketing program is aid to the distributor's customer—the dealer. This is accomplished by training salesmen in how to sell the end user; by providing effective literature on end use; by demonstrations of effective use; by programs before such groups as garden clubs; and by *effective* dealer aids and point-of-sale material.

Specific recommendations offered by Ortho to garden supply dealers are summed up in an article by Channing E. Jones Jr., Ortho merchandising manager, that appeared in *Modern Garden Center* magazine. Mr. Jones urges dealers to arrange merchandise to achieve eye and sales appeal; to keep shelves and aisles uncluttered; to utilize all available space in a manner that will bring returns; to keep the store interior colorful and, at the same time, expressive of cleanliness; and to use timely, mass displays for seasonal needs.

The use of mass displays is important when one considers the possibilities of developing impulse sales through the massing of related objects. According to Mr. Jones, mass displays, plus interest, add up to produce quick and profitable turnover of home garden merchandising.

The interest factor in the equation outlined by Mr. James often is the responsibility of the salesman. Harry Gross of the Northwest Feed and Insecticide Company in Spokane, Wash., is of the opinion that his $400,000 annual garden business would drop by 25 per cent if his sales people stopped asking questions and supplying honest information in response to customer's questions. Advertising plays an equal part in arousing and maintaining the interest of home gardeners. Effective advertising by garden supply dealers, however, must be properly timed and planned, to be successful. In addition, it must be consistent. One-shot ads do not result in a long-range profit. Advertising departments of large concerns can be

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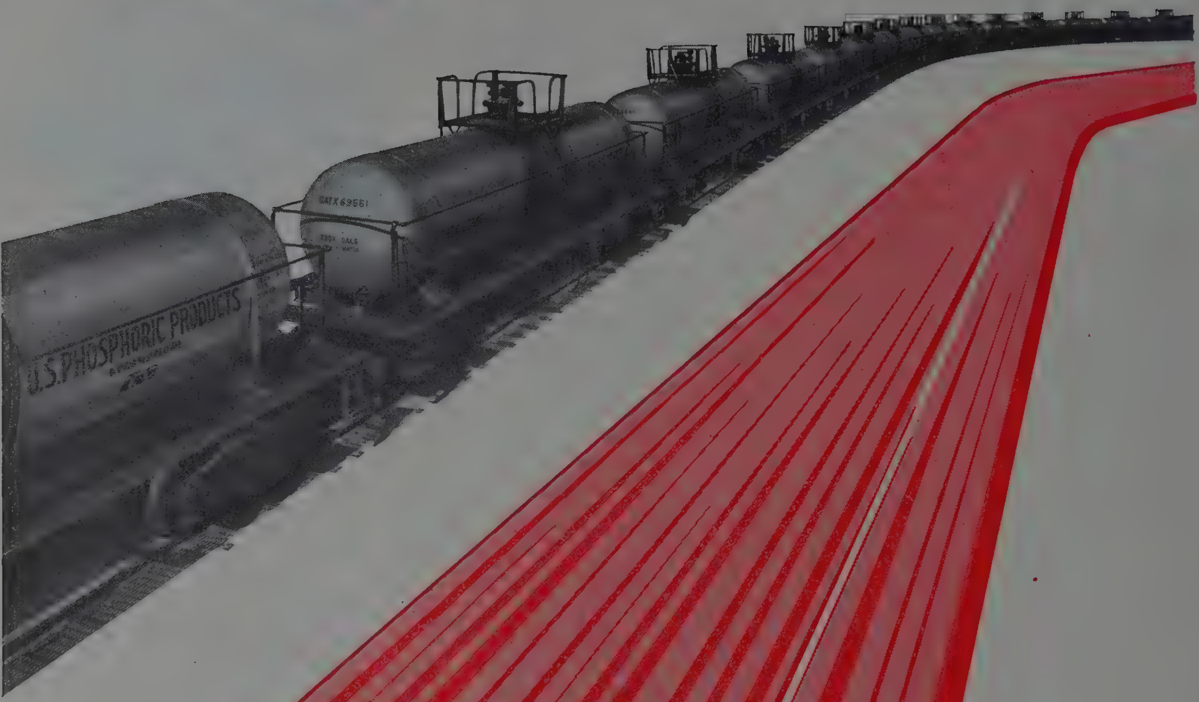

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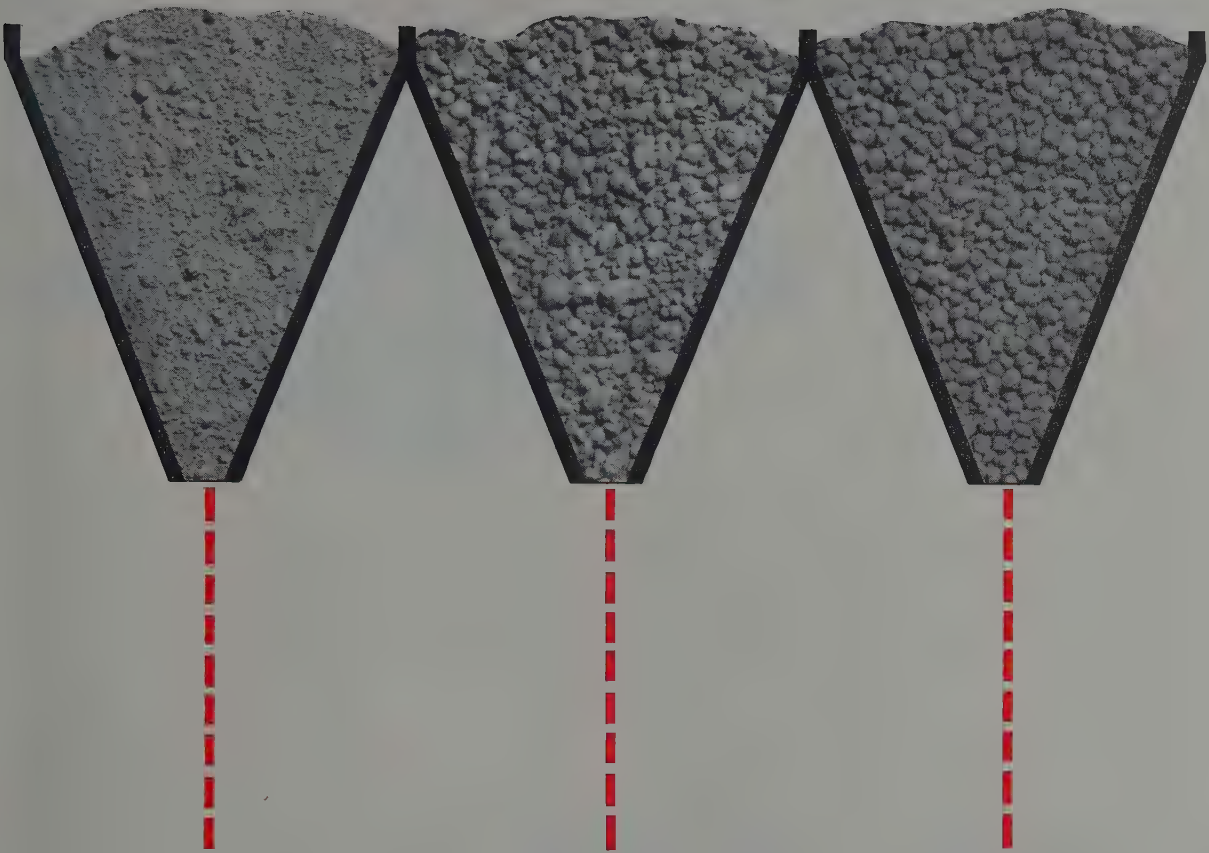

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Some Current Problems

GRANULAR PESTICIDES

Demand for and commercial use of granular pesticide formulations have forged ahead of investigational work on equipment characteristics and product specifications required to fulfill most advantageously the demands of an insect control program. Standards are often set without full consideration of all factors involved.

Successful end results require full recognition of the interrelationship of inert carrier, specific pesticidal chemical, solvents and other additives, method of processing, and method and equipment used to distribute the finished product in the field. Best results demand consideration of the overall program.

by Kenneth Krausche
Floridin Company
Tallahassee, Florida

SINCE the publication of a previous article[1] two years ago, the production and application of granular insecticides and herbicides have expanded with considerable rapidity. Although the program has been eminently successful, this tremendous growth has brought with it a certain degree of confusion. There are a number of problems which require serious research and thoughtful consideration, if continued development and optimum beneficial results in this field are to be realized to the full potential.

Demand and commercial use of finished granular pesticide formulations have forged ahead of investigational work on equipment characteristics and product specifications required to fulfill most advantageously the demands of the control program. Individual manufacturers, and some state groups, tend to set arbitrary standards without full consideration of all the factors involved. Successful end results require full recognition of the inter-relationship of inert carrier, specific pesticidal chemical, solvents and other additives, method of processing, and method and equipment used to distribute the finished product in the field. For example, there would be little benefit in the application of an ideal finished product by applicating equipment incapable of a fairly uniform distribution and accurate calibration, nor would a well-engineered machine be capable of good distribution of a non-uniform product, with a very wide range of particle sizes from lumps down to a high dust or fines content. Similarly, a high quality inert granular carrier used as a starting raw material could be ruined by attrition during improper processing. Best results demand consideration of the overall program and compatibility of all its parts — carrier, pesticide, additives, processing, and application.

One source of confusion is the great variety of particle size ranges demanded by this market. Limiting this discussion for the moment to the widely used absorptive carriers, there is an almost infinite variety of types and sizes theoretically possible. In the earlier article, the RVM and LVM types were described and mesh size designations were defined. Some of the mesh ranges in demand today include 15/30, 16/30, 18/35, 20/35, 20/40, 24/48 and 30/60. There may be others. Although one mesh range of finished product could not possibly be optimum for all end uses, it appears likely that a number of over-lapping size fractions could be eliminated for the sake of practical aspects of production, availability, and economy.

One inconsistency in mesh size designation is the simultaneous use of two different systems: U. S. Standard Sieve Series and Tyler Standard Screen Scale. U. S. Standard Number 20 is identical with Tyler 20, but U. S. Standard Number 40 is equivalent to Tyler 35. Obviously, a granular carrier of 20/40 mesh range on the U. S. Standard scale is equivalent to a 20/35 on the Tyler scale. Number 24 appears only on the Tyler scale, Number 30 only on the U. S. Standard scale; Number 16 appears on both scales but designates different size openings, while Number

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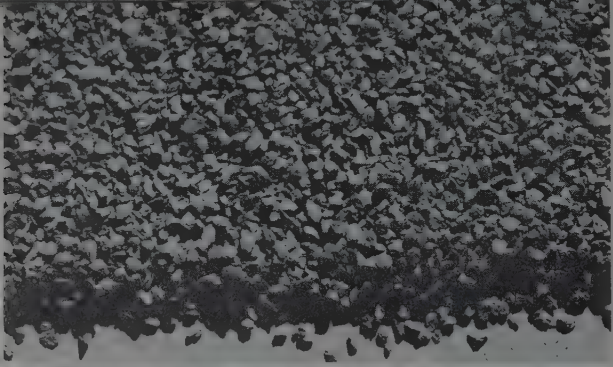
[1] *Granular Pesticides*, Agricultural Chemicals, April, 1959, pages 30-32.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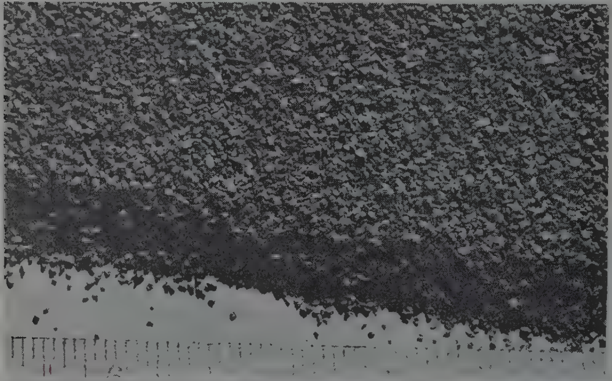
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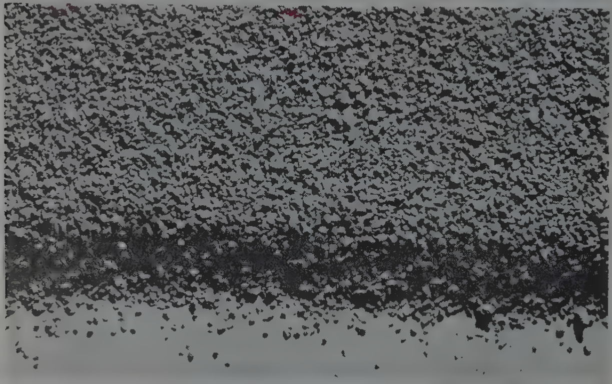
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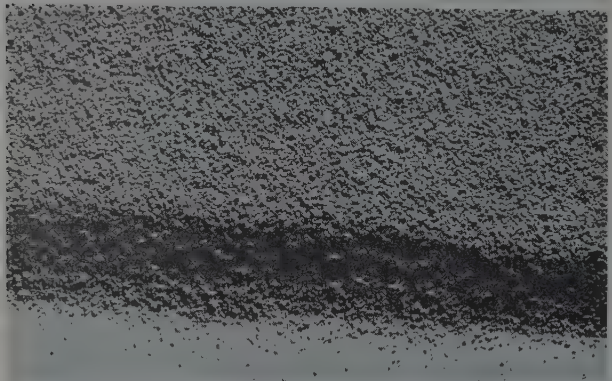
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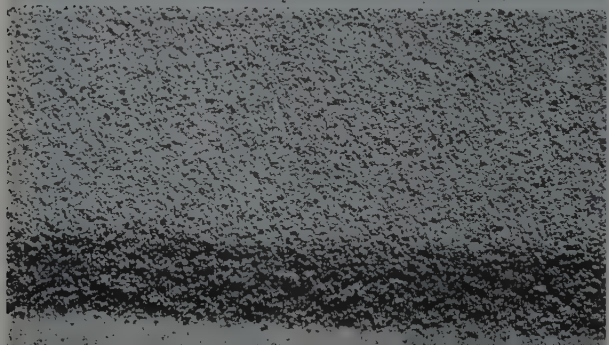
30/60

60 also appears on both and, in this case, indicates exactly the same size openings. This possible source of misunderstanding could be cleared up easily by adoption of one standard scale.

Somewhat more controversial is the determination of practical limits on permissible amounts of fine material. The formulator may assume that a 20/40 mesh carrier contains 0% coarser than 20 mesh and 0% finer than 40 mesh. Some of the carriers can be produced with only a small fraction of 1% fine material. But, to clean up these products beyond practical commercial limits would be slow, laborious, and expensive. Even then, the mere packaging, shipping, unloading, etc. would produce some degree of attrition, resulting in some measurable amount of "dust." In general, the closer cut carriers, with a minimum of fines, are more expensive than the products covering a broader mesh range and containing slightly more material passing the screen which nominally defines the fine end of the product. These practical aspects should be recognized in the industry and reasonable tolerances, especially on the fine end, allowed. On the other hand, too high a content of fines or dust interferes with uniform distribution, increases drift, and may defeat the basic purposes of the granular pesticide program. Significantly, some formulations of oily, waxy, or sticky technical pesticides, carefully processed, contain a smaller amount of dust than the starting carrier used as the sorptive base. As the pesticide is impregnated onto the carrier, the free dust adheres to the surface of the granular particles. The use of a scalper screen is another way of cleaning up a granular carrier or the finished granular pesticide.

Unfortunately, the highly competitive market, marginal profits, and buying habits of the consumer so often characteristic of the agricultural chemicals industry are not always conducive to adequate consideration of quality.

In running sieve analyses, the sampling procedure and precision of the method itself are important factors. In any package of granules, some segregation in regard to particle size tends to take place when the package is handled or moved. A random grab-sample may contain a relatively high proportion of fines. A complete and intact bag-full, usually 50 pounds net, should be run through a sample-divider to derive a representative sample for screen analysis. Concerning reproducibility of the method itself, limited study has indicated a need for more complete standardization of the method of screen analysis in order to improve accuracy. One limiting factor, often not recognized, is that the standard testing sieves, themselves, may deviate significantly from the mathematical designation. For example, even with precision wire screen sieves, the permissible variation in average opening for screens between U. S. 18 and U. S. 70 is ± 5%. That would allow approximately a ± 10% variation in the area of the average opening. The maximum opening in a given screen may exceed the nominal designation by as much as 15% in the U. S. 18 to 35 screens and as much as 25% in U. S. 35 to 70 screens.

In setting mesh specifications on granular carriers, and on finished granular pesticides, therefore, those concerned must be cognizant of these inherent deviations and recognize the necessity of practical tolerances in their demands.

Before leaving the discussion of screen analysis and mesh designation, it should be mentioned that mesh range limits alone are not enough to completely define particle size. Obviously for a given granular carrier, smaller particle size will result in more particles per pound. But it is possible for two true 20/40 mesh lots of the same mineralogical material to vary significantly in number of particles per pound because of different distribution within the mesh range as shown by the following.

Suppose two 20/40 mesh absorptive carriers, A and B, have a distribution of particle size within the 20/40 range as follows:

	A	B
20/25	10%	20%
25/30	30	40
30/35	40	30
35/40	20	10

In round figures, the particles per pound of carrier in these narrow ranges would be close to the following:

20/25	1,125,000
25/30	1,900,000
30/35	3,250,000
35/40	5,400,000

Calculations based on the foregoing figures show that Product A would have approximately 3,062,500 particles per pound while B would have approximately 2,500,000—yet both are true 20/40 mesh carriers. The actual difference between A and B probably would be greater than the calculation indicates, because skewing would exert influence even within the narrow range increments listed. Within the 20/25 increment, for instance, Product B would be expected to have a higher proportion of material closer to the coarse limit of 20 mesh than would Product A. Conversely, within the 35/40 increment, Product A would doubtless have a greater proportion of particles at or near the fine limit of 40 mesh than would Product B.

Particles per pound can be translated to particles per square inch when applied at a given number of pounds per acre. For example, some representative types of granular carriers, when distributed at ten pounds per acre, and assuming perfectly uniform broadcast distribution, would yield the following deposits:

Type and Mesh	Approximate Particles per pound	Particles per Square Inch
RVM 16/30	1,210,000	1.93
RVM 18/35	2,330,000	3.71
LVM 18/35	2,565,000	4.09
RVM 24/48	6,200,000	9.70
LVM 24/48	6,800,000	10.80
RVM 30/60	11,250,000	17.90

The addition of the pesticide, plus solvents and adjuvants, if any, would increase the density of the formulation above that of the carrier alone. A 20% Aldrin granule has a density about 33% greater than the absorptive carrier used in its formulation, and a pound of the finished product contains only about 75% as many particles. Therefore, in the application of the finished pesticide formulation, there would be fewer particles per square inch than indicated in the foregoing tabulation.

It will be noted that the LVM (or calcined) type of granule contains more particles per pound than the same mesh range product of the RVM (not calcined) type. During the high heat treatment of calcination, weight is lost by expulsion of combined water. There also is some shrinkage and an increase in true density, an increase in per cent pores, and a decrease in apparent density. There is little, if any, significant difference in practical sorptive capacity between LVM and RVM types.

Under rather severe conditions of attrition, tests in the Floridin Company laboratories have indicated that RVM attapulgite granules suffer about one and one-half times as much mechanical breakdown as the corresponding LVM types. Although LVM granules may thus have an advantage in this respect, actual commercial experience has shown that good finished granular products can be made from either RVM or LVM types with reasonable care in handling and processing. Without reasonable precaution and adequate processing equipment, the finished granular pesticide may

(*Continued on Page* 91)

A Farmer's View Of Chemical Weed Control

There is no particular secret to doing a good job with chemical herbicide materials, and, by following recommended weed control practices, net farm income can be kept at a favorable level.

by Arthur Pacheco Jr.
Marana, Arizona

DURING the past several years, the price of cotton, costs of production, and yields have been uppermost in our minds because of their effect on our net income. After all, it is our net income that is of interest to the absentee owners of the cotton farm for which I am hired as farm manager.

I can't do very much about the price of cotton and, although my average yield over the last eight years is above two bales per acre, it has become increasingly difficult to get those extra high yields. For instance, the yield in one field had dropped from over 2.5 bales to the acre in 1954 to 1.8 bales by 1958. Much of this loss can be attributed to the increasing amount of verticillium wilt on our farm. Now, of course, we are doing everything possible to increase our yields by using wilt-tolerant varieties and a crop rotation program.

We have, however, been able to do something positive about our weed problem. The two weeds that give us the most trouble on our farm are Johnson grass and the annual morning glory. Gradually, the Johnson grass menace is being eliminated almost completely. In 1953, we had a $23 per acre hoeing cost, most of which was for chopping out Johnson grass. The grass was so thick in a great many places that we were forced to use a renovator with sweeps to knock down the beds and cut out the grass so that we could plant. We are in a water association and, at that time, the water company still was using men with scythes to cut the Johnson grass on the ditch banks. The men, of course, never could get around fast enough to cut all the grass before it went to seed. Every year, as a result, we had a completely new stand of grass every time we irrigated because the seed would float down our delivery laterals right onto our fields. This situation now has been corrected. The water company now controls Johnson grass on the ditch banks with applications of herbicidal oil.

We plant more than 100 acres of skip-row cotton every year, and last year we tried spraying with herbicide for the first time. We had been using a renovator with sweeps to clean out the weeds in the skips, but the spraying worked out especially well last year and I am trying it again this year. Although the appearance of the field was much nicer after renovating than after the herbicide application, we no longer have a new crop of weeds germinating every time it rains. The treatment (with Dowpon) leaves a shaggy appearance to the field because the dead weeds remain standing. We can live with this appearance, however, if our costs are lower in the long run.

The annual morning glory, on the other hand, presents an entirely different situation. In 1954, the cost for hoeing was causing some concern. The morning glories were a problem mainly on the heavier soils, but, probably because of our cotton picking machines, they were spreading very rapidly. We plannned to treat about 100 acres with herbicide in 1955. Heavy rains, however, during June and July kept the spray rigs out of the fields and the morning glories just about ruined us. We spent an average of $34.20 per acre that year for hoeing. In one field, the cost came to $56.11 per acre.

In 1956, we contracted for a custom applicator to apply Monuron to our field and our costs for weeding went down to $20.00 per acre. The custom operator applied the herbicide again in 1957 and our hoeing cost went down to $8.36 per acre. The Monuron and application costs us another $6 per acre.

By the end of 1957, quite a few farmers in our area had used the material and some reported that results achieved had been poor. It has been our experience, however, that the advanced stages of verticillium wilt look very much like Monuron damage. We apply herbicide in early July and shortly after that the first summer rains start. Shortly thereafter the first symptoms of verticillium wilt begin

(*Continued on Page* 87)

From a talk entitled "My Weed Control Program," presented at the Western Cotton Production Conference, March 7 and 8, in Phoenix, Arizona.

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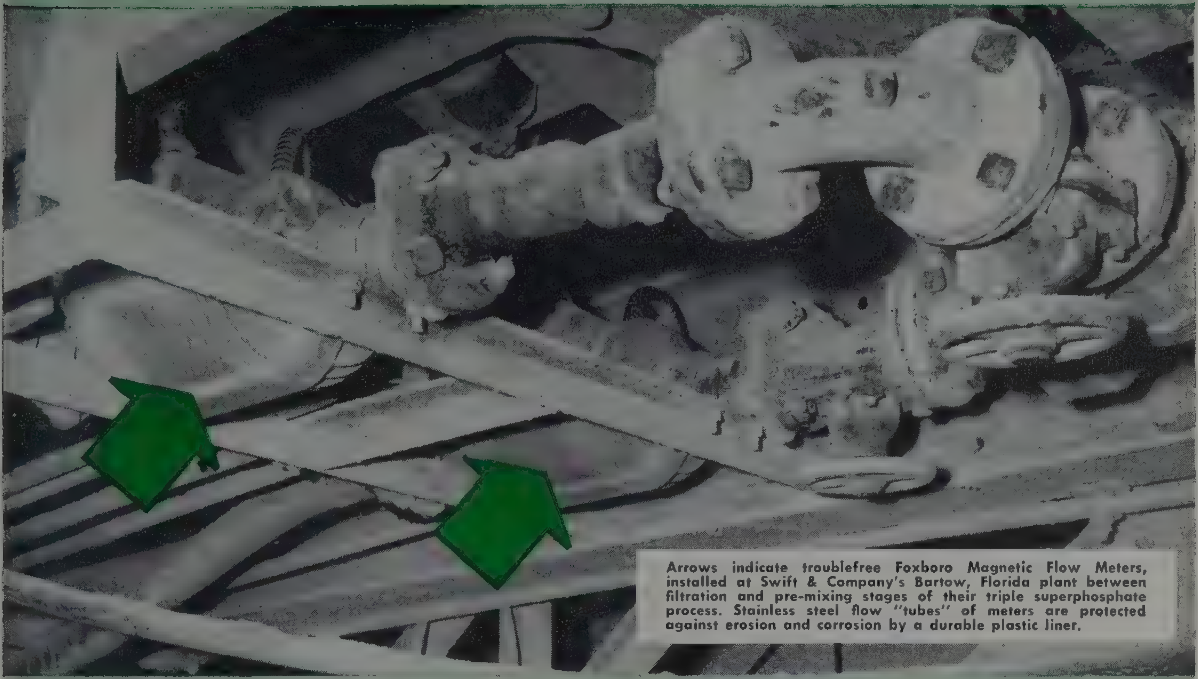

Arrows indicate troublefree Foxboro Magnetic Flow Meters, installed at Swift & Company's Bartow, Florida plant between filtration and pre-mixing stages of their triple superphosphate process. Stainless steel flow "tubes" of meters are protected against erosion and corrosion by a durable plastic liner.

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MAGNETIC FLOW METERS

Consumption Of Fertilizers And Primary Plant Nutrients

The total tonnge of fertilizer consumed in the U. S. during the year ended June 30, 1960 was down 290,000 tons from the previous year. Primary plant nutrients, however, were consumed in record amounts. Consumption of nitrogen was up 3.6 per cent, consumption of P_2O_5 was up .6 per cent, and consumption of K_2O was up 2.1 per cent above the amounts for the preceding year.

by Walter Scholl, Marion M. Davis, and Caroline A. Wilker

Fertilizer Investigations Research Branch
Soil and Water Conservation
Research Division
Agricultural Research Service
U. S. Department of Agriculture
Beltsville, Maryland

FERTILIZER products marketed for farm and non-farm use in the United States during the year ended June 30, 1960, were generally lower in tonnage than in the preceding year. Total consumption based on shipments by manufacturers, sales by liquid nitrogen applicators, and on State tonnage reports was 25,022,000 tons. This was 290,000 tons (1.1 percent) less than the 25,312,672 tons recorded for the year ended June 30, 1959. There were increases in 18 States and the District of Columbia. In these, 713,000 tons more fertilizer were consumed totaling 9,605,000 tons or about 38 percent of overall consumption. California, Florida, and Georgia accounted for 526,000 tons of the increase. Consumption decreased in 31 States and Puerto Rico by 1,003,000 tons, approximately one-half of which was in Illinois, Missouri, and North and South Carolina. These changes in consumption from the preceding year were scattered through most of the regions. Increases were noted for all States in the West South Central region while decreases were recorded in all States in the Middle Atlantic and East North Central regions.

Mixed Fertilizers

Mixed fertilizers comprise 63.5 percent of the total tonnage of all fertilizer products consumed, and amounted to 15,880,000 tons —a decrease of 189,000 tons (1.2 percent) from consumption (16,069,027 tons) for the year ended June 30, 1959. In 21 States and the District of Columbia, increases were recorded totaling 429,000 tons, of which 336,000 tons were in Florida and Georgia. There were decreases in 28 States and Puerto Rico totaling 618,000 tons. Twenty States to the east of the Mississippi River recorded decreases and only eight to the west.

There were 50 grades recorded in amounts of 50,000 tons or more, totaling 12,233,000 tons. These accounted for 77 percent of the total tonnage mixtures and about 1,700 other grades made up the remaining 23 percent of the tonnage consumed. The relative use of most of these 50 grades corresponded to that of the preceding year, although at a somewhat lower level. Five of the grades—5-10-10, 4-12-12, 5-20-20, 12-12-12, and 10-10-10—were those recorded in largest amounts and their combined tonnages accounted for about one-third of the total tonnage of mixtures consumed each year. One or more of these five grades are among the grades consumed in largest tonnages in most of the States.

Materials

Materials marketed for direct application amounted to 9,142,000 tons and comprised 36.5 percent of all fertilizer products used in the year ended June 30, 1960. Included in this tonnage are 7,767,000 tons of materials containing one or more of the primary plant nutrients (N, P_2O_5, K_2O) and 1,375,000 tons of materials containing only secondary and trace nutrients, principally calcium and sulfur, largely in the form of gypsum. The consumption of materials containing primary nutrients decreased 253,000 tons (3.2 percent), whereas consumption of secondary and trace nutrient materials increased 152,000 tons (12.4 percent).

The principal kinds of materials and the tonnages marketed in each region are shown in table 1. Chemical nitrogen products comprised the only class of primary nutrient materials which increased in overall use. Although most of the products listed in this class were used in lower quantities than in the preceding year, the higher use of anhydrous ammonia, urea, and in particular, the nitrogen solutions offset the decreases in quantities of the other product used. Consumption of the natural organics was generally lower in most areas. The use of phosphate materials decreased as a class but registered gains in the New England, West South Central, and Pacific regions. Of the listed products, consumption increased only in the ammoniated phosphates and decreased principally in basic slag and phosphate rock. Potash materials consumed as a class decreased but recorded a small increase in the South Central region. The increased use of the secondary and trace nutrient materials was due principally to the increase in the tonnage of gypsum used in the Pacific region.

Primary Nutrients

Primary plant nutrients supplied by all fertilizer products consumed during the year ended June 30, 1960, totaled 7,571,000 tons (table 2). This amount based on the guaranteed nutrient content of these products, with allowances for overruns and underruns determined from analyses of samples reported by State fertilizer control officials, was higher than that found for the larger tonnage of products used in the preceding year. This represented an increase in primary plant nutrients of 155,000 tons, (2.1 percent) from that (7,415,713 tons) consumed in 1958-59. In 1959-60, consumption of nitrogen was 2,767,000 tons, an increase of 94,000 tons (3.6 percent); that of available P_2O_5, 2,566,000 tons—15,000 tons (0.6 percent) more; and that of K_2O, 2,238,000 tons—46,000 tons (2.1 percent) above their amounts in the preceding year. These quantities establish a record high in the Nation's history easing last year's consumption into second place.

Mixtures supplied 1,052,000 tons (38.0 percent) of the nitrogen, 2,043,000 tons (79.6 percent) of the available P_2O_5, and 1,967,000 tons (87.9 percent) of the K_2O. Although the tonnage of mixed fertilizer products was slightly lower than in the preceding year, the content of primary nutrients was higher by 134,000 tons and accounted for over one-half of the increase in available P_2O_5 and K_2O. These higher nutrient contents from lower tonnage of mixtures reflect the continued upward trend in use of higher grade mixtures. The weighted average nutrient contents of mixtures consumed in 1959-60 were for nitrogen 6.6 percent; for available P_2O_5, 12.9 percent; for K_2O, 12.4 percent; and for the total of these nutrients, 31.9 percent. The corresponding averages for the preceding year were 6.22, 12.54, 11.91, and 30.67 percent, respectively.

Primary nutrients supplied by direct-application materials comprised 1,715,000 tons (62.0 per-

(*Continued on Page 96*)

Table 1. Kinds of fertilizers consumed, year ended June 30, 1960, by region, in 1,000 tons[1] (preliminary)

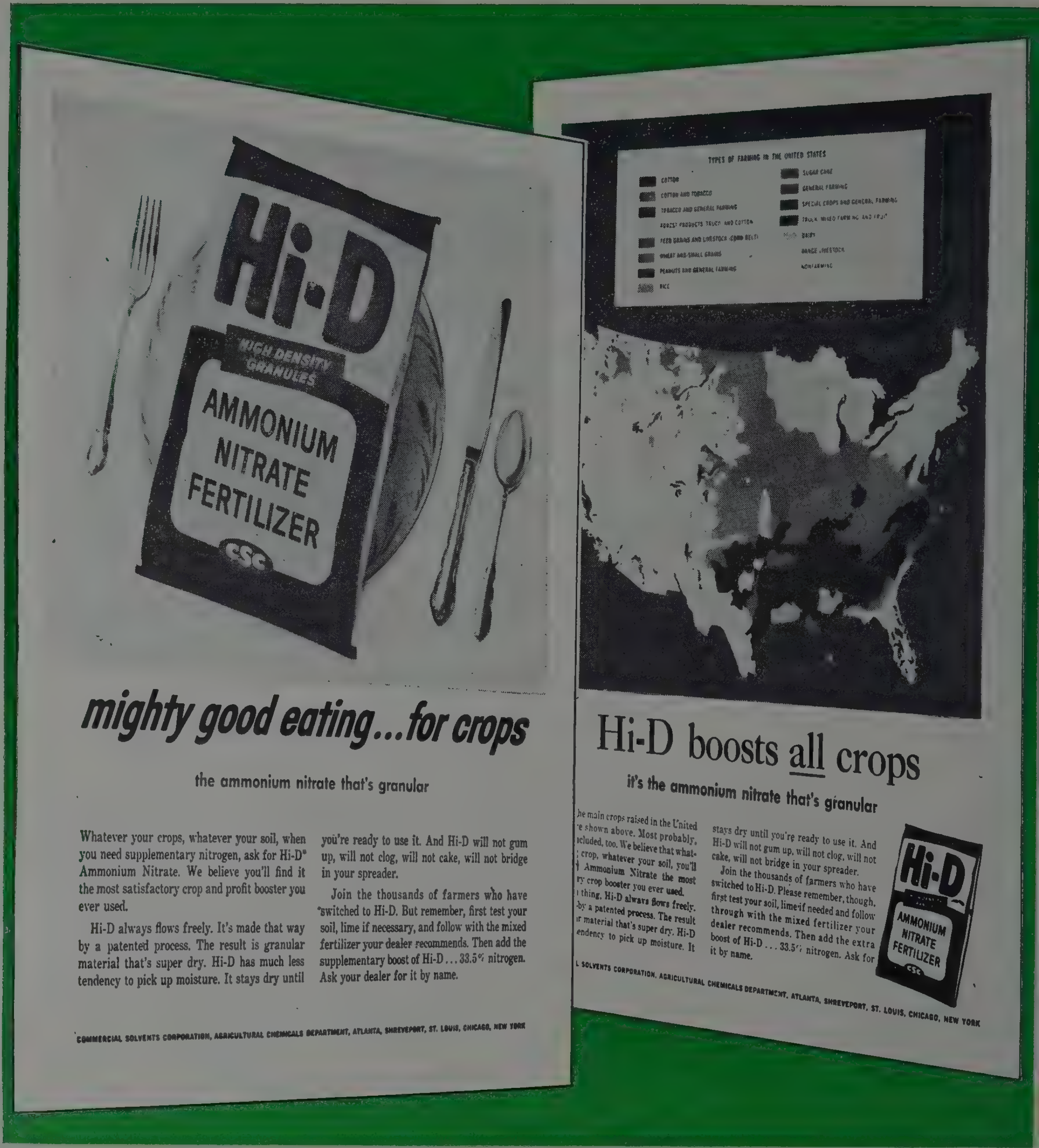
Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Hawaii, Puerto Rico	Total: Consumption	Total: Change from year ended June 30, 1959
MIXTURES	342	1,743	5,306	3,391	1,550	2,075	710	81	412	270	15,880	-189
CHEMICAL NITROGEN MATERIALS	15	88	819	513	725	609	515	237	929	75	4,525	31
Ammonia, anhydrous	0	3	26	79	179	72	166	46	145	1	717	[illegible]
Ammonia, aqua	0	[2]	0	7	15	3	7	23	311	42	398	[illegible]
Ammonium nitrate[3]	7	31	157	158	312	284	127	77	77	1	1,231	[illegible]
Ammonium nitrate-limestone mixtures	[2]	1	221	[2]	0	37	4	1	[2]	0	264	[illegible]
Ammonium sulfate	[2]	12	5	106	9	14	80	45	239	25	535	[illegible]
Nitrogen solutions	3	6	161	122	200	29	37	10	79	0	657	[illegible]
Sodium nitrate	2	12	224	2	[2]	159	54	[2]	[2]	[2]	453	[illegible]
Urea	1	9	5	27	7	4	31	20	37	6	147	[illegible]
Other[4]	2	13	20	12	3	7	9	15	41	[2]	122	1
NATURAL ORGANIC MATERIALS	17	34	31	35	10	3	7	7	329	[2]	473	[illegible]
Dried manures	5	11	5	7	4	2	2	1	272	0	309	-13
Sewage sludge, all	7	16	11	27	6	1	2	4	47	[2]	121	-10
Tankage, all	2	5	3	1	0	[2]	0	[2]	1	[2]	13	-6
Other[4]	3	2	12	[2]	[2]	[2]	3	1	9	0	30	-16
PHOSPHATE MATERIALS	32	82	89	633	522	196	247	197	280	14	2,292	-222
Ammoniated phosphates[5]	[2]	2	1	20	187	5	121	88	131	3	558	19
Basic slag	0	0	13	0	0	58	3	0	0	0	74	-66
Calcium metaphosphate	[2]	[2]	1	5	12	16	[2]	[2]	[2]	0	35	-9
Phosphate rock & colloidal phosphate	[2]	8	26	471	127	16	23	[2]	[2]	3	675	-163
Superphosphate: 22% and under	30	65	43	46	46	89	51	16	110	1	498	-10
" : over 22%	[2]	3	2	88	149	11	44	79	20	7	403	-2
Other[4]	1	3	3	3	1	1	5	13	18	[2]	48	8
POTASH MATERIALS	2	9	76	204	49	68	40	3	15	10	477	-18
Potassium chloride	1	6	33	199	49	51	38	2	8	9	396	-10
Other[4]	1	3	43	5	1	17	2	1	7	1	81	-8
TOTAL: PRIMARY NUTRIENT FERTILIZERS	408	1,956	6,321	4,776	2,856	2,951	1,519	526	1,965	369	23,647	-442
SECONDARY & TRACE NUTRIENT MATERIALS	[2]	6	101	4	1	6	3	30	1,221	3	1,375	152
Gypsum	[2]	5	97	1	1	5	1	22	1,162	0	1,294	134
Other[4]	[2]	1	4	2	[2]	1	2	8	59	3	81	18
TOTAL: ALL FERTILIZERS	408	1,962	6,422	4,780	2,857	2,957	1,522	555	3,187	372	25,022	-290

[1] Due to rounding, totals of items may not add to column or class totals. [2] Less than 500 tons. [3] Undetermined quantities may have been used for non-fertilizer purposes. [4] Includes quantities undesignated by kind. [5] Includes all reported quantities of grades: 11-48-0, 13-39-0, 16-20-0, 20-52-0, 21-53-0, and 27-14-0.

Table 2. Primary plant nutrient contents of mixtures and materials consumed in regions and United States, year ended June 30, 1960, by kinds,[1] [2] in 1,000 tons (preliminary)

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Hawaii and Puerto Rico	United States: Consumption	United States: Change from year ended June 30, 1959
						Nitrogen						
MIXTURES	28	106	300	221	142	102	61	12	47	34	1,052	52
MATERIALS	5	29	208	201	361	206	253	108	325	18	1,715	[illegible]
Ammonia, anhydrous	0	2	21	65	147	59	136	38	119	---	[illegible]	[illegible]
" aqua	0	---	0	2	3	1	1	5	62	9	83	-14
Ammonium nitrate	2	11	53	53	105	96	43	26	26	---	415	-34
Ammonium nitrate-limestone mixtures	---	---	46	---	0	8	1	---	---	0	56	-8
Ammonium sulfate	---	2	1	22	2	3	17	9	50	5	111	-4
Calcium cyanamide	---	1	2	---	0	1	2	1	1	---	8	-1
Natural organics	1	[illegible]	[illegible]	[illegible]	[illegible]	---	---	---	[illegible]	---	[illegible]	[illegible]
Nitrogen solutions	1	2	41	39	71	9	11	3	18	0	195	36
Phosphate products	---	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] products	---	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sodium nitrate	---	[illegible]	36	---	---	26	9	---	---	---	[illegible]	[illegible]
[illegible]	[illegible]	4	2	12	3	2	14	9	17	3	[illegible]	[illegible]
Other chemical nitrogen products	[illegible]	2	2	3	1	---	---	2	6	---	16	4
Total nitrogen	[illegible]	135	508	422	503	308	314	120	372	52	[illegible]	[illegible]
						Available P_2O_5						
MIXTURES	40	208	490	561	302	235	119	16	56	16	2,043	[illegible]
MATERIALS	7	19	14	79	149	41	62	71	78	3	523	-14
Ammoniated phosphates	---	1	---	10	58	2	30	25	33	1	100	3
Basic slag	0	0	1	0	0	5	---	0	0	0	6	-6
Calcium metaphosphate	---	---	1	3	8	10	---	---	---	0	23	[illegible]
Natural organics	1	1	1	1	---	---	---	---	6	---	11	[illegible]
Phosphate rock and colloidal phosphate[3]	---	---	1	14	4	---	1	---	---	---	21	[illegible]
Superphosphate: 22% and under	6	14	8	9	10	18	10	3	22	---	100	[illegible]
" over 22%	---	1	1	41	69	5	20	35	9	2	193	[illegible]
Other phosphate products	---	1	1	1	---	---	---	7	8	---	19	[illegible]
Total, available P_2O_5	47	227	504	640	451	276	181	87	134	19	2,566	[illegible]
						K_2O						
MIXTURES	43	198	626	526	193	234	79	3	30	35	[illegible]	53
MATERIALS	1	5	28	123	30	36	23	2	17	6	271	-7
Natural organics	---	---	---	[illegible]	---	[illegible]	---	[illegible]	[illegible]	---	[illegible]	[illegible]
Potassium chloride	1	4	20	121	30	31	23	1	5	5	241	-6
Other potassium products	---	1	8	2	---	5	---	1	4	1	[illegible]	1
Total, K_2O	44	203	654	649	223	270	102	5	47	41	2,238	46
GRAND TOTAL: N, available P_2O_5, K_2O 1959-60	124	565	1,666	1,711	1,177	854	597	212	553	[illegible]	[illegible]	[illegible]
1958-59	130	575	1,562	1,765	1,146	818	952	207	542	[illegible]	[illegible]	[illegible]
1957-58	129	539	1,366	1,569	886	726	497	196	501	103	6,512	-904

[1] Due to rounding, totals of items may not add to column or class totals.
[2] Dashes (- - -) represent quantities less than 500 tons.
[3] Represents a weighted average of 2 per cent for the colloidal phosphate and 3 per cent for the phosphate rock.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AMMONIUM NITRATE FERTILIZER
CSC
TYPES OF FARMING IN THE UNITED STATES
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COTTON AND TOBACCO
TOBACCO AND GENERAL FARMING
FOREST PRODUCTS TRUCK AND COTTON
FEED GRAINS AND LIVESTOCK (CORN BELT)
WHEAT AND SMALL GRAINS
PEANUTS AND GENERAL FARMING
RICE
SUGAR CANE
GENERAL FARMING
SPECIAL CROPS AND GENERAL FARMING
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Revamped Bagging Department Ends Production Slow-Downs

By enlarging and remodeling the bagging department, Planters Fertilizer and Phosphate Company has solved the problem of moisture and dust which had led to periodic shutdowns of the company's bagging operations for cleaning. Production in the remodeled department now is up 25 per cent.

ALTHOUGH the problem of dust is common to virtually all fertilizer manufacturing establishments, fertilizer plants located in Charleston, South Carolina are faced with the added factor of humidity. The moisture in the air at Charleston soars in the summer, fall, and winter, to say nothing of spring, and it is a serious factor in slowing bagging operations at fertilizer plants there.

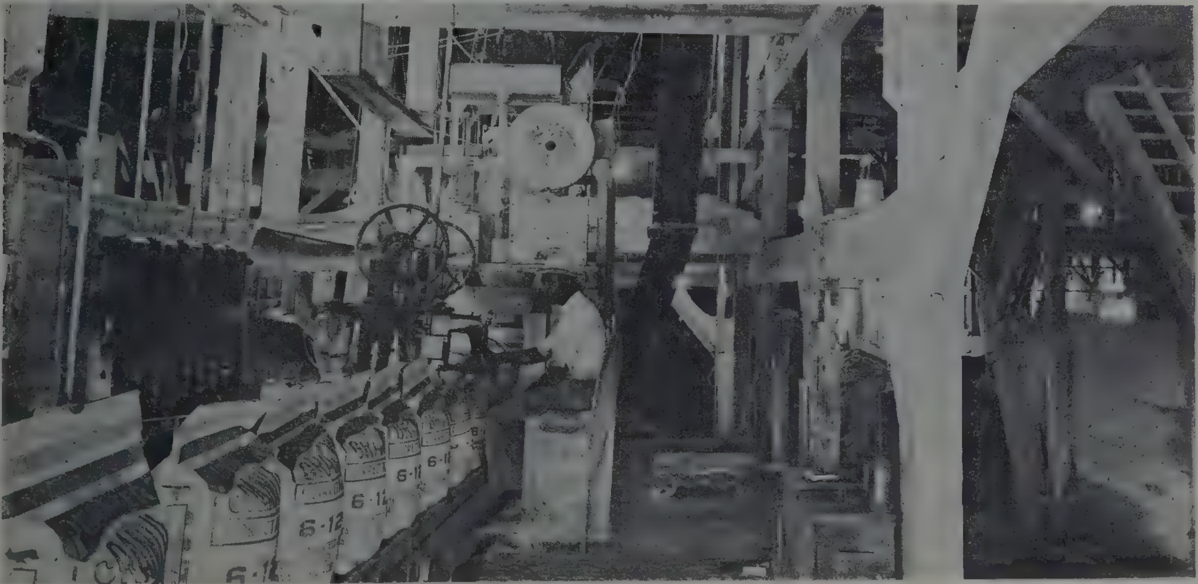
A. C. Palmer, general manager of Planters Fertilizer and Phosphate Company of Charleston, said recently, "Since we have this high humidity—the highest of any city along this area of the coast, we have to contend with it the year around, mainly in maintaining production in the bagging and shipping department." Planters produces complete mixed pulverized fertilizer and complete granular fertilizer, by the TVA process, at its plant on King Street in Charleston for distribution throughout South Carolina and parts of North Carolina, Virginia, and Tennessee.

Last year, Planters officials turned their attention to a solution to the problem of moisture and dust which had led to periodic shut-downs of the company's bagging machine for cleaning, with a consequent loss of production. With the assistance of packaging engineers from Union Bag-Camp Paper Corporation, New York, the bagging and shipping department was enlarged and remodeled.

A major change in the bagging department was the installation of Union-Camp's I & C Bagger. The machine which Planters had been using was equipped with an open lever system which lent itself to the accumulation of dust and moisture, leading to occasional shut-downs. The I & C Bagger, by comparison has a dust-sealed lever system and dial scale which resist dust and moisture accumulation.

Production in the remodeled department is now up 25 per cent and slow-downs for cleaning out equipment have come to a halt. In addition, an I&C conveyor system

An overall view of the modernized shipping and bagging department, which now is on a straight-line basis.



Following the addition of a 36-foot truck conveyor at the Planters Fertilizer and Phosphate Co. plant, it now is possible to load two trucks, one at each door, without taking out time for switching trucks. As soon as one conveyor is loaded, the feed line is switched to a cross-over conveyor.

was installed that makes it possible to load as much as 400 tons a day of fertilizer onto trucks. Furthermore the loading operation requires only two men. Under the old conveyor system, one man was required at the end of the conveyor, one on the truck, and five men were required to operate hand trucks.

The speed-up in the conveyor system was made possible by the addition of a 36-foot truck conveyor. This, plus a cross-over conveyor, makes it possible to use two doors for loading trucks instead of one. With the trucks standing by, one extension of the conveyor is placed over one truck. As soon as this vehicle is loaded, the feed line is switched to the cross-over conveyor which drops bags on another I&C conveyor. Thus, the second truck is loaded without switching.

"By using this system, when we have one truck loaded and ready to go, the other is in the process of being loaded," Mr. Palmer reports. "The loading of the second truck now takes less time than previously was required to switch it into the position of the first truck," he adds.

The equipment employed at the Charleston plant (the company operates another plant at Charlotte, N. C. to serve that area) for the manufacture of pulverized fertilizer includes a complete hopper system for raw materials which are conveyed to a two-ton Atlanta Utility mixer where nitrogen solution is injected by pressure and materials are blended. From this point, the complete pulverized fertilizer is conveyed to storage.

The bagging and shipping area, mounted on an elevated floor some twenty feet wide, is conveniently located near the bulk storage area under the new arrangement. On the adjoining bulk floors, scoop bucket trucks move the product over the ground to an opening back of the elevator pit where a bucket elevator lifts it 42 feet from where it is dropped to a screen. From there, it goes into a hopper and down to the scales. Two hoppers are located immediately over the bagger and sewer. One of these is used as a mixing hopper for special grades and, when this one is put into operation, the flow to the bagger by-passes the other hopper.

Sulfuric acid at Planters is produced by the lead chamber process and for superphosphate production a 60" high-side Raymond mill is used to grind phosphate rock. Other equipment includes a 40-ton Sturtevant den and a 50-ton per hour pulverized manufacturing unit and three shipping units. The company's complete 20-ton per hour granular plant makes it the only plant in South Carolina to have a granular operation.

The most popular grades produced at the Charleston plant are 4-8-12 pulverized and 4-12-12 granular.

Much of the fertilizer output is handled in multiwall bags, although some burlap bagging still is carried on. According to Mr. Palmer, the use of multiwalls is on the increase because of their adaptability to color printing and better display potentialities.

With the automatic open-mouth bag packer, the company is maintaining a production rate ranging between 17 and 22 100-pound bags per minute. Furthermore, the open faced dial scale on the machine is credited with a reduction in rate variations of two to four ounces per 100-pound bag.

A minimum of space is required for this operation and it was installed without major alterations to the fifty-five year old plant. While a large part of the output now is shipped by truck, the bagging department is situated on a railroad siding and, when it is necessary to load a freight car, the recently-added conveyor can be put to use for that purpose also.

Regarding operations with the burlap bags, Mr. Palmer reports that 200-pound bags were filled at the rate of 13 to 15 per minute on the I & C Bagger. "We are maintaining these speeds with a satisfactory weight accuracy of two to four ounces variation, and it would be possible, I believe, to bag up to 600 tons per day off the one machine," Mr. Palmer said.

Planters is one of the oldest fertilizer companies in the Carolinas. It was started in 1906 by J. Ross Hanahan, who still is active as chairman of the board of directors. Other officers are W. O. Hanahan, president; J. R. Hanahan, Jr., vice president; J. S. Hanahan, secretary; and Mr. Palmer as general plant manager.

The company produces fertilizer on a year-around basis and, although they do not offer small package products for home and garden use, they do mix various pesticide formulations with the fertilizer to meet customer demands.★★

STABILIZATION

Of Dry Pesticide Formulations

Introduction of the synthetic organic insecticides in the 1940's emphasized the problem of chemical compatibility in dry pesticide formulation. Finished formulations often are limited to those combinations of pesticides and diluents which are chemically compatible.

This article is based on a paper presented at the 139th ACS meeting in St. Louis by Eugene P. Ordas, Velsicol Chemical Corp.

Table I.

Catalytic thermal decomposition of DDT heated one hour at 115-120°C.[2]

	mols HCl released per mol of DDT		mols HCl released per mol of DDT
DDT	none	hydrated lime	none
kaolin	1.03	calcium oxide	none
bentonite	.32	talc USP	none
alumina	none	Pyrax ABB (sample 1)	.04
iron powder	none	Pyrax ABB (sample 2)	.91
Fe_2CO_3	none	talc, west coast	1.03
$Fe Cl_3$	3.00	talc, Vermont	none
fuller's earth	1.0	talc, off color, Md.	1.05

It should be noted that the samples of Pyrax ABB and talc which showed the marked degrees of activity may have contained traces of available iron.

Table II.

Properties of some common types of pesticide carriers and diluents

	% Deactivator H^3 req'd for heptachlor	oil sorption gms/100 g
diatomaceous earth	1 - 5	100 - 200
attapulgite	6 - 11	100
montmorillonite (incl. bentonite)	4 - 12	23 - 70
kaolinite	0 - 3	25 - 54
pyrophyllite	0 - 1	25 - 50
talc	0 - 1	24 - 40
limestone	0	5 - 8

PERHAPS the most critical problem in dry pesticide formulation which necessitates compromise and adjustment is chemical compatibility. Introduction of the synthetic organic insecticides in the '40s emphasized this problem, especially with the mineral carriers and diluents. Product instability was generally assumed to be caused by such factors as pH, catalytic amounts of heavy metal impurities, moisture, air (oxygen), light, temperature, etc. Oftentimes, product decomposition could be traced to one or more of these factors.

Researchers[1] in 1944 reported that as little as .01% anhydrous ferric chloride would catalyze the dehydrochlorination of technical DDT. They found that fullers earth and some other mineral products also showed catalytic activity, and suggested that this probably was due to the presence of small amounts of iron compounds. Present day findings on the relative catalytic activity of mineral species agree in general with data in Table I .

Many commercial laboratories, including those of basic producers, have independently studied the compatibilities of insecticides with mineral diluents and carriers. It was found in early work that practical concentrations and the physical properties of the finished formulations were often limited to those combinations of pesticides and diluents which are chemically compatible.

To meet the demand for dry flowable concentrates of the liquid and low-melting insecticides, sorbent carriers such as diatomaceous earths and attapulgites are required For solid and high-melting insecticides, relatively low sorbency carriers and diluents such as kaolinites and talc are physically satisfactory, even for high concentrations, because simple dry-blending techniques followed by fine grinding are adequate for producing homogenous flowable powders.

In the case of heptachlor, (see Table II) it was found that the deactivator requirement decreases generally as the bulk density increases, and as the sorptivity decreases. An exception to this generalization is the class of diatomaceous earths, which, although very high in sorbency and very low in bulk density, are intermediate in their requirement of a deactivator. It also is interesting to note that the cost of these materials increases directly with their sorbency. Were it not for the need of highly sorbent carriers for preparing concentrates of liquid toxicants with

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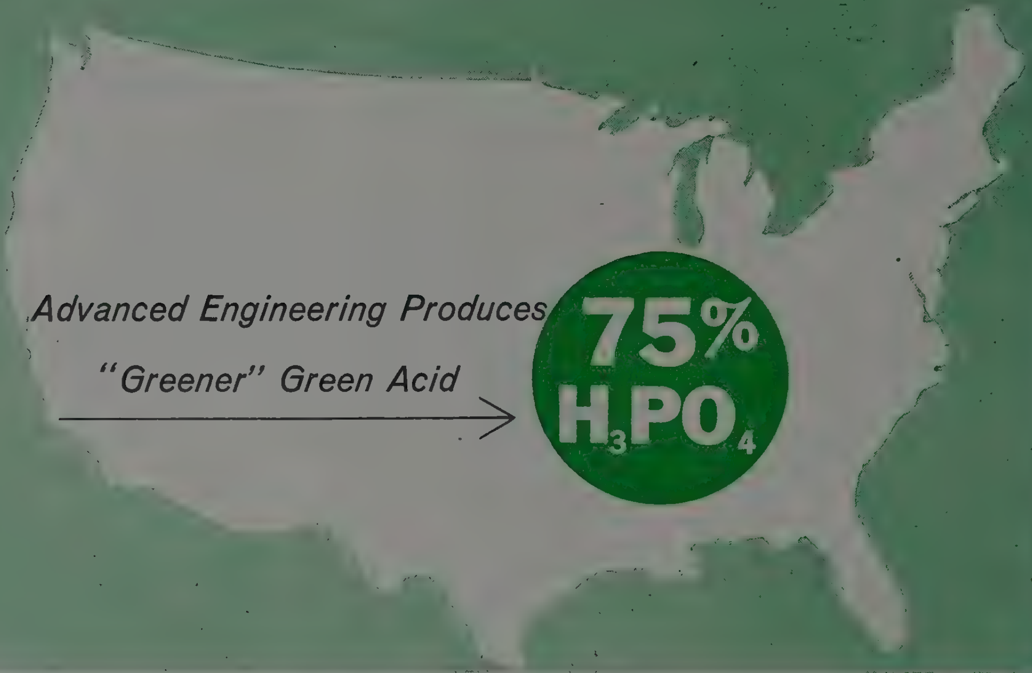

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moderate bulk density, the talcs, kaolinites, etc., and more compatible diluents would be preferred.

Rate of heptachlor decomposition on mineral carriers and diluents has been found to depend on the catalytic activity of the mineral;—it also has been found that this activity is a function of surface acidity.[4] Using a series of indicators[5] (known as the Hammett indicators), surface acidity of a mineral can be estimated.

In dust formulations, the rate of decomposition of heptachlor is accelerated at elevated temperatures. The accelerating effect of elevated temperatures has been observed in studies on storage stabilities of dieldin and endrin, malathion, methyl parathion and aramite. It has been shown also that the rate of decomposition is independent of the toxicant concentration and that decomposition is a zero order reaction.[6]

A large number of additives studied[7] as heptachlor deactivators, included nitrogenous bases such as urea and hexamethylene tetramine, inorganic bases such as lime, sodium carbonate, and calcium carbonate; and oxygenated compounds such as alcohols, ketones, glycols, ethers, etc. Of this group, the oxygenated compounds showed the greatest effectiveness.

In consideration of such physical properties as vapor pressure, flammability, etc, mono-, di- and tri-ethylene glycols were studied as possible clay deactivators. Using from 0 to 7 per cent diethylene glycol calculated on the weight of attaclay, the rate of heptachlor decomposition was shown to decrease as the amount of deactivator was increased. Similar results were obtained in studies on Barden Clay (a kaolinite) and Celite 209 (a diatomite). Other studies show that diethylene glycol could be used effectively to deactivate a wide variety of mineral carriers and diluents and that the quantity of deactivator required for heptachlor formulations is inversely proportional to the pKa (surface acidity) of the untreated minerals.

The susceptibility of methyl parathion toward catalytically active carriers and diluents has been described in manufacturers' technical bulletins. It is decomposed by moisture, alkalies and strong acids, heat and surface acidity. Because of this, extreme precautions must be taken in the selection of carriers and diluents, process conditions and storage conditions. At room temperature, a 10% methyl parathion formulation on an undeactivated attapulgite will decompose between 35 and 40 percent within 15 minutes. By pre-deactivation of the carrier before impregnation, this rapid rate of decomposition can be considerably retarded.

Because methyl parathion decomposes rapidly in the presence of alkali, alkaline deactivators should be avoided. HMT, for example, which in water has a pH of 8 to 9, is considered unsuitable as a deactivator for methyl parathion carriers and diluents. On the other hand, glycols and glycol ethers, which are neither basic nor acidic, simplify the choice of deactivator for many toxicants and their formulations, which are sensitive to alkalis or acids.

The attapulgites frequently are used as carriers for methyl parathion dust concentrates, because of their sorbency, moderate cost, desirable flowability characteristics, etc., but they need as much as 10% diethylene glycol for deactivation. The diatomaceous earths also may be used as carriers for high concentrations of methyl parathion, because of their very high sorbency and lower deactivator requirement, which is about 4 per cent of diethylene glycol. They, however, cost more than the attapulgites. The effect of their low bulk density and possible dustiness must be considered, as they may affect the desired handling properties of the concentrate.

Diluents of lower cost and lower surface acidity such as talc, pyrophyllite and calcium carbonate have been recommended by many basic producers of methyl parathion for letting down to field strength the methyl parathion concentrates prepared on the more sorbent carriers. In general, technical bulletins of the basic producers classify mineral type carriers and diluents for methyl parathion, according to degree of activity as follows:

- least active
  - calcium carbonates
  - talcs
  - pyrophyllites
- moderately active
  - diatomaceous earths
  - kaolinites
  - micas
  - vermiculites
  - synthetic calcium silicates
- most active
  - attapulgites
  - montmorillonites

DDT may be considered a relatively stable material when formulated alone as a 50 per cent dust base, — and it is doubtful if many formulators use any deactivator when it is formulated with an active carrier such as attapulgite. Normally, this would create no problem. However, when field-strength dusts with methyl parathion (such as 2.5 methyl parathion-5 DDT) are prepared by cut-back from their respective concentrates, an unstable product may result unless the surface acidity of the DDT concentrate is deactivated to over pKa 3.3 with a neutral de-

(*Continued on Page* 88)

In the development of processes for the manufacture of dry pesticide formulations, practical consideration must be given to the order of addition of the formulation ingredients.

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AG CHEM Production Round Table

by F. T. Nielsson
International Minerals &
Chemical Corporation

Rotary Ammoniator and Granulator Technology

In the seven years that have passed since the first pilot-plant demonstration of the rotary ammoniator, plant experience has resulted in relatively few changes. Certain techniques, however, are better than others and a knowledge of them may be helpful to operators who have not taken advantage of them. Part 1 of a two-part report.

THE rotary ammoniator was publicly unveiled to the industry on September 15, 1953 (1, 2). Since that first demonstration over 85 installations have been made (3), indicating that the equipment must have some of the features that were claimed for it. These were a high absorption of free ammonia and an ability to handle fertilizer material undergoing physical transition into the plastic stage with a minimum of power and external accessories.

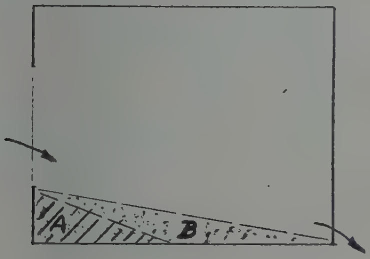

Figure 1.

Although some installations utilize the rotary ammoniator only for its ammoniating characteristics, in most instances its ability to handle material beginning to plasticize has resulted in the equipment finding its main field as the ammoniation component of a fertilizer granulation process.

In the seven years that have passed since the pilot plant demonstration, plant experience has resulted in relatively few changes in the ammoniator. Of course, not all the shortcomings of the rotary ammoniator have been solved, but enough information is available to indicate that certain techniques are better than others. It is the aim of this article to discuss these techniques in the belief that they may be of advantage to operators who have not heard of them, or have not taken advantage of them because of a lack of understanding of the underlying principles.

Bed Action

The rotary ammoniator depends upon a rolling bed for efficient operation. The motion of the bed engenders mixing of the stream of raw materials, brings fresh materials into contact with the ammoniating solution and/or mineral acid, aids in agglomerating particles, and provides an orderly displacement of materials from the feed to the discharge end.

When the rolling action is weak or absent, wet or soupy spots develop because fresh solids no longer are brought into contact with the fluid streams. The resultant over-ammoniation brings about loss of ammonia, and the over-acidulation of nitrogen solution with mineral acids results in the generation of nitrogen oxides. Agglomeration is a function of the

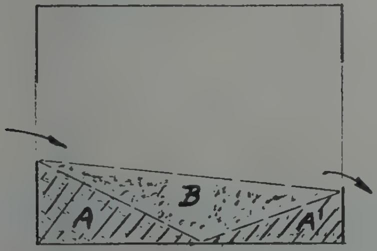

Figure 2.

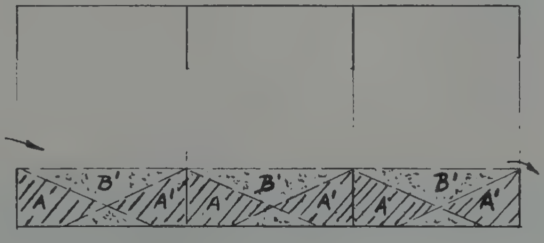

Figure 3.

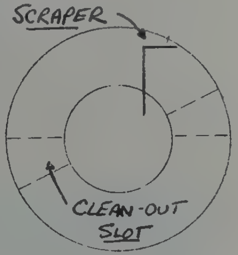

Figure 4.

speed of rotation of the particles undergoing agglomeration, and a weak rolling bed with slowly revolving particles results in the formation of large balls if plasticizing conditions exist.

The rolling action is imparted to the bed by the wall and the end dams of the cylinder that comprise the drum of the ammoniator. The function of the dams appears to be more important than is the action of the cylinder wall. The latter finding is one not fully appreciated by operators and equipment manufacturers.

The pilot plant ammoniator in the 1953 demonstration was of "square" design; that is, the length equalled the diameter in common with the majority of batch ammoniators of that day. The discharge dam was one-quarter the diameter because that was the height that appeared to be the best compromise between a rolling bed, good ammonia absorption, and resistance that would not displace the distributor. The nitrogen distributor was positioned 2 inches from the shell for the same reasons. As plant scale ammoniators were built, the first ones were of "square" design also; that is, 6′ x 6′ or 7′ x 7′, and bed action appeared satisfactory. In search of longer retention time at higher production rates, later versions were made longer in length than in diameter. Soon stories were heard of flash fires, overagglomeration and excessive losses of ammonia. Although some of the problems were due to the use of 98% or 100% sulfuric acid, I believe most of the difficulty could be traced to insufficient bed action.

Figure 1 illustrates the theory of how a rolling bed is generated at the feed end of a cylinder equipped with an inlet dam. The "area of action" generated by the intersection of the dam and the cylinder is shown in the triangle *A*. The intensity of the rolling bed decreases in triangle *B* as it leaves area *A* and is almost non-existent as it overflows the discharge lip.

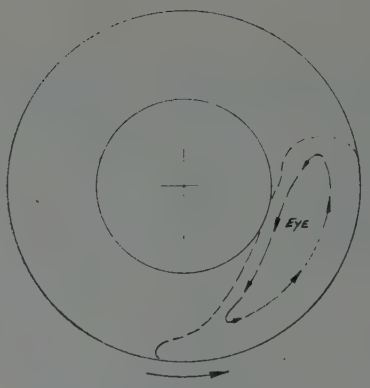

Figure 5.

In Figure 2, the addition of a discharge dam has created another area of action that intersects with that at the feed end and transfers its energy to the entire bed.

As the dams are moved further away from each other the "areas of action" caused by the intersection of the dam and the cylinder cease to contact each other and "dead" areas result. In these dead areas there is a minimum of movement, resulting in high concentrations of liquid caused by puddles of solution, acid and reacted solids. The dead area is increased further in some cases by operators who believe that the deeper the distributor is under the bed, the better the absorption, and therefore they position the distributor right against the shell, effectively stopping the transmission of lifting energy from the shell to the particles in the bed.

As long as the ammoniator is of square design, and the height of the dams is at least ¼ the diameter, with the distributors forming a compact bundle 3 to 4 inches from the shell, it has been found that rolling action is automatic, even with a smooth shell. As the length increases in proportion to the diameter, without an increase in the dam height, bed action begins to decrease in the center of the ammoniator where usually the greatest percentage of solution is being added. This is particularly noticeable with stainless steel shells that present a relatively smooth surface.

PART II

of this report on rotary ammoniator and granulator technology will appear in the June issue of Agricultural Chemicals.

A simple way to overcome the lack of rolling action in long ammoniators would be to provide a regular dam at the half way point. However, this action would necessitate the use of dual distributors and scrapers and would complicate the installation unduly.

A more workable compromise is to provide a series of 2 inch high dams on 2 foot centers along the length of the ammoniator, with the distributor bundle 2 to 3 inches above the intermediate dams. The scraper bar needs only a short indentation to clear each dam. A six-inch opening in each dam, with openings staggered, will allow the cylinder to empty when needed, as shown in Figures 3 and 4.

The system of intermediate dams described above has been effective in eliminating dead areas in extra long ammoniators.

Other means for promoting bed action are to increase the height of the discharge dam, thus extending the "area of action", or to use a scalloped edge scraper. The scalloped scraper will cut a series of grooves in the crust adhering to the shell and each groove will act as a miniature dam. Both of the above increase the resistance of the cylinder to being turned.

In many cases, installing intermediate dams will cause overloading of the drive motor because more energy is being transferred to the bed. This is analagous to the increase in power consumption by a mixer motor when baffles are installed in a tank containing fluids being mixed.

Granulation

If one examines a transparent cylinder containing free flowing particles, e.g., sand, while the cylinder is being rotated in a man-

(*Continued on Page* 90)

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AG CHEM Fertilizer Views and News

by Vincent Sauchelli

Dr. Sauchelli is a Consultant to the Agricultural Chemicals Industry.

Research Creates Food Abundance

AFTER my long visit in India and other Asian countries and my return to our land of plenty of food and other good things in life, I am convinced our people are better off struggling with the problem of surplus than with the problem of not enough. Why is it that we have so many persons in our country who cannot appreciate how fortunate we are to have so productive and versatile an agriculture? It is the envy of a great many less fortunate nations. We read in newspapers and magazines that the rate of farm production in the United States far exceeds that of population growth; the farmers have increased in efficiency faster than the number of people has grown. Is that fact so regrettable? I believe it is not.

Things have changed vastly on our farms, even within the memory of most of us, especially in those factors that impinge on methods of farming and varieties of crops. Less than 45 years ago, farmers generally followed a walking plow, drudged at forking hay, hand-milking cows, and fetching water by hand; farms had no autos, tractors, combines, field balers, side-delivery rakes, corn-pickers, and milking machines. Electricity was the privilege of a very few farmsteads. Imagine the conditions when there were no paved roads, buses, radio, television, county agents and extension services, rural credit agencies or oil and gas heat. Those were the so-called "good old days." Good for what! Our farms now are almost completely mechanized: plowing, seeding, combining, trucking are done with powered equipment. The American farmer commands more than 33 horsepower per worker. Improved varieties of crops and soil management practices and greater use of commercial fertilizers have greatly helped to boost crop yields per acre with considerably less labor. For example, in 1800, 370 hours of farm labor were required to grow and harvest 100 bushels of wheat; in 1900, about 100 hours; by 1940, 43 hours; and, at present, about 25 hours. Within a century and a half, our farms have progressed from about 4 hours to produce a bushel of wheat to about 1 hour to produce 4 bushels.

How different is the picture of food and fiber production in India and other Asian countries! In those countries, except Japan, human and animal muscle still provide the power on their farms, and the lack of commercial fertilizers and pesticides and improved soil management practices keep crop yields per acre to a bare subsistence level. Farming in those countries is usually unalloyed drudgery.

Should our farm abundance be deplored? Should agricultural research projects be suspended to allow consumption to catch up with production? That is the counsel of despair. Perhaps we should change the emphasis of research: research to increase output should be slowed up for a while in favor of research on the industrial uses of farm crops and on ways of cutting production costs without increasing output. Many experts have proposed this change in research goals. The proposal seems wise and practical. Perhaps, also, farmer and government agencies should do much more hard selling in the food markets. Millions of our people, say the experts, now spend money on food more from necessity to eat rather than for balanced nutrition or the pleasure of enjoying good, well-prepared meals. They prefer to economize on food so as to be able to buy other things. Competition for the consumer's dollar is terrific: modern maketing techniques must be adopted if farmers want to capture their share of it.

In this connection we inevitably come back to a discussion of future needs with increase in population. It is estimated that, by 1975, the population of the United States will be about 200 million and in 50 years about 360 million. Will those future Americans go hungry? To maintain the present living standards with no improvements in the diet (even though needed) in 50 years, our farms will have to supply twice as much food and other products, that is, double the crop production and more than double live-stock production. These increases are to be achieved on but little more land and perhaps considerably less manpower. Remember, at present, American farms are using less than 10 per cent of the Nation's total labor force.

Now, 50 years is not a great span of time. The year 2000 is not so distant that our people can af-

(Continued on Page 87)

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AG CHEM

Washington Report

by Donald Lerch

THE consumer, who has long had a role in the policy-making machinery of the Federal Food and Drug Administration, now is likely to be given a role in forming some U. S. Department of Agriculture policies as well.

In FDA, the consumer's voice is heard through a system of consumer panels. Through these panels, their views are made available to the top policy makers in the Administration. The plan for USDA, however, appears to favor a more formal arrangement. Under it, consumers would serve on elected farm commodity committees. These would be set up to determine programs for individual commodities if proposed farm legislation is passed by Congress.

Agriculture Secretary Orville Freeman's view is that, "whenever it is determined that a program is needed for a particular commodity, at least one member of the commodity committee selected to formulate this program shall be appointed to represent the consumer point of view."

Secretary Freeman says that farmers have managed agriculture so successfully that the United States is now the world's leading agricultural nation. What is needed now, he adds, is some means for managing this productive capacity to meet human needs. In all such programs checks and balances will be needed to protect the public interest and one such balance would be "to maintain the voice of the consumer in the formulation of any program dealing with the farm commodities produced in this country."

Secretary Freeman appears to be concerned primarily with means for reducing surpluses of a few key commodities. However, his plan may introduce a new factor in official agricultural circles of special interest to agricultural chemicals manufacturers.

As industry leaders have pointed out many times, consumers' lack of intimate knowledge of farm production problems on occasion has thrown up a real obstacle to agricultural progress. Both industry and government have spent many hours in educating consumers as to why pesticides and even chemical fertilizers have to be used in food production.

If consumer representatives are to become part of the official farm family, the chances are that even greater efforts must be made to make sure consumers understand more details of farm production. Looking on the bright side, consumer members of commodity committees might be in a good position to learn the facts first-hand and be able to pass them on to other consumers.

Whatever else might be said about this proposal by Secretary Freeman, it does underscore a major challenge of our time. Communications is becoming an ever larger problem, and it must be solved if agriculture and the agricultural chemicals industry are to continue to move ahead.

Extension Service Head

One of the developments in the U. S. Department of Agriculture which has aroused much interest among fertilizer manufacturers is the announcement by Secretary Orville Freeman that Dr. E. T. York, Jr. is to be the Administrator of the Federal Extension Service.

Dr. York will come to his new post from the Alabama Extension Service, which he has directed since 1959. Immediately prior to that time, however, he was Eastern Director of the American Potash Institute and active in such groups as the American Grassland Council.

His sound grasp of the need for improved fertilization may be reflected in the work of USDA's Extension Service in Alabama, where he gave full support to a program stressing the increased income farmers can get from a sound fertilization program.

He told fertilizer people meeting in Atlanta that "these fertility programs have proved to be an excellent extension tool and in many cases have been responsible for the county agent's having reached farmers with whom he heretofore had been unable to communicate." He added, "In some counties, where these programs have been carried out, farm income has been increased in one year's time by several million dollars."

Non-Farm Market

The National Plant Food Institute is stepping up its program to expand the use of fertilizers in the growing non-farm market. Every new lawn and every old, rundown lawn in the country stands as a potential for the sale of fertilizers and pesticides as well.

To make home-owners and other non-farm users aware of what fertilizer can mean in terms of better lawn, NPFI this year distributed five articles by its Chief Agriculturist, Jess Garman, to 1,950 newspapers in the south, midwest, and northeast.

Now they are following up with production of a motion picture on turf fertilization for use by NPFI members, by schools and colleges, by garden clubs, and others concerned with lawn beautification.

Well-kept lawns and gardens are becoming so much a part of outdoor living, that some in the industry even feel it would make sense to provide each new home owner with instructions on how to grow and maintain a good lawn at the same time that he receives materials on how to operate the many new appliances inside his house.

They argue that the home builder would benefit, too. For he gains from selling attractive outdoor living today as well as convenient indoor living.

Heavy Legislative Year

By all odds, 1961 so far has been one of the heaviest legislative years for the pesticide industry. NAC has been kept busy reviewing some 400 bills introduced in the state legislatures, and the legislative season is not completely over.

The vast majority of bills, however, have taken into consideration the practical needs of farmers and others as well as the requirements of consumers. This can be taken as a tribute to the growing public understanding of pesticides' vital role in modern life.

Chemicals In Foods

As we have reported earlier, the problem of chemicals in or on foods is rapidly becoming of international concern. Due at least in part to the volume of anti-chemical publicity here, other countries are taking a hard look at the safety of foods imported from the U. S.

The latest entry into this field is West Germany. The irony here is that German scientists are credited by some with launching chemical agriculture with early work on chemical fertilizers.

The current problem in West Germany apparently was set off by the arrival in Germany of oranges colored and treated with a chemical to prevent fungi damage during transit. German housewives are now asking for more information.

NAC, which has taken a position of leadership in providing facts on food safety to American housewives, is making its slide film "Pesticides — Boon To Mankind" and other materials available for use in West Germany.

Meantime, NAC is launching a new program to consist of one-minute transcribed radio reports to consumers. The one-minute reports will cover the many ways in which the proper use of pesticides improves man's food supply, his health, and his comfort. Included in the reports will be quotes from leading doctors, scientists, and political figures.

Helicopter Association

Fertilizer and pesticide manufacturers may be interested in an association which has just moved to Washington and will play a part in fertilizer and pesticide application. It's the Helicopter Association and its members are business firms which hire out helicopters for crop dusting, air taxi service, powerline patrol, forest fire fighting and so on.

Although in existence for 13 years, the Helicopter Association just this year established a permanent full time staff, headed by Executive Secretary John L. Pennewell, and moved into headquarters in the Landmark Building, 1343 H Street, N. W., Washington 5, D. C.

The Association now has about 60 member firms of a total potential of over 260. The entire industry is now doing $50,000,000 worth of business a year, part of it in crop dusting.★★

Constant Vigilance Required To Safeguard Food Supplies

POISONING pests without poisoning people is the complex problem facing today's growers and food processors as they work to provide consumers with safe, wholesome food of good quality, Carl G. Smith, produce director for Gerber Products Co., Fremont, Mich., told the Michigan State University conference on residues in foods March 27-28. Mr. Smith said that the job is a tough one and requires constant vigilance.

The wholesomeness of our food supply and the protection of the consumer is foremost in the minds of everyone connected with the growing, packaging, and selling of food, he said. Today's consumers, he explained, demand superior quality and improved sanitary standards, and chemicals offer the only economical means for controlling insects or diseases that can damage or destroy crops.

Properly used, he said, chemicals do great good; improperly used, some can be dangerous. We must use agricultural chemicals with the same care with which we use chemicals in our medicine cabinets, he warned. Wide public understanding of the facts about chemicals is essential, he continued, if our farmers and food industry are to continue giving us the present abundance of good foods we can enjoy in safety.

Mr. Smith suggested that processors adopt the following four-point approach to the food residue situation:

1. Remember that our first responsibility, in this area, is to supply the consumer with "safe" food.
2. Work with federal and state agencies, trade organizations, universities, and others in providing information from the grower to the processor to insure 100 per cent compliance with pesticide labels.
3. Use properly equipped laboratories to check selected samples of raw and finished products.
4. Cooperate fully with the various regulating agencies.

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Multi-purpose insecticide with residual action against insects attacking forage crops and stored grain; and for control of many insect species on fruit and vegetable crops. Direct application to livestock controls horn flies, cattle lice and ticks.

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Safety Factors In Agricultural Aviation

Success will accompany the aerial application team in which the members are able to take a broad and sympathetic outlook on the problems of other members of the team. Safety should never be subordinate to the desire to make money.

LOW flying has been defined as follows: "Flight at such an altitude that the pilot's attention must be given in the main to the avoidance of the ground or obstacles on the ground." From this definition, it can be deduced that the pilot must be able to fly his aircraft automatically, and he must be reasonably experienced.

Except when he is going from place to place, the agricultural pilot nearly always is flying within reach of the various obstacles on or near the ground. It is not a job, therefore, for the inexperienced pilot. The trouble is that the inexperienced pilot does not always realize that he has to think further ahead when he is flying at, say 2,000 feet above the ground. It is probably true to say that, for every foot a pilot flies above the ground, he has double the time to think, when it comes to avoidance of contact with the ground or an obstacle on the ground. It is the converse of this that is vitally important in low flying. Failure to recognize this point has led to many quite unnecessary accidents in all types of flying.

While there is nothing inherently difficult in low flying, therefore, it is well to attempt it with a very full realization of what a mistake can lead to, and it is vital to remember either to think farther ahead than usual, or to quarter the reaction time.

The foregoing may suggest that pilot error is the main cause of accidents in agricultural aviation. This is not the case, and the following are various ways in which those concerned with agricultural aviation can make contributions to flight safety.

Aircraft Manufacturer

1. Give the pilot as good a view in all directions as possible. This, like a good many other things, is bound to end up in a compromise, but one of the pilot's best hopes of survival is the ability to see obstacles in time to avoid them.

2. Try and design the aircraft so that any fractured part of it does not, in the event of a crash, impale the unfortunate pilot.

3. Design the aircraft, spray gear, and dusting gear as one entity — and avoid hanging bits on afterwards as an afterthought.

4. Position the controls of the spray gear just as carefully as the engine and flying controls are positioned. The easy manipulation of the gear is vital to the pilot for it must be done at a time when he can least afford distraction from looking where he is going.

5. Manufacturers should not be influenced by the operator who says he wants an aircraft with no frills, and that electrics and hydraulics and pneumatics only add to his initial costs and maintenance troubles. If a few dollars a year on initial cost and maintenance will save a pilot's life, then it is well worth it.

This article is taken from the report of the First International Agricultural Aviation Conference, published in 1960 by the International Agricultural Aviation Centre, The Hague, Netherlands. It is based on remarks made at the conference by W. D. Miller (Wing Commander), Colonial Pesticides Research Unit, England.

Pilot

1. A pilot should not try this type of flying until he has had quite a bit of general flying experience.

2. He should not give way to pressure and try to do a job in conditions which all his experience and knowledge tell him are unsuitable.

3. He should not be too proud to ask someone else for an opinion if he is unsure of something. It may save his life.

(*Continued on Page* 89)

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Warren Nichols

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How To Obtain Best Results From Chemical Defoliation Of Cotton

Applying defoliants too early will result in the loss of top immature bolls, or, at least, cotton from such bolls will be inferior in quality and yield. Applying defoliants too late may result in a poor leaf drop due to low temperatures. Timing is important.

by Howard E. Ray
Extension Cotton Specialist
University of Arizona, Tucson

RAPID progress toward complete mechanization of cotton production has been made in the West during recent years and mechanization of the picking operation has focused on chemical defoliation as a means of increasing harvest efficiency and maintaining lint quality. The use of defoliants now is an established practice in California and the lower elevations of Arizona, but cotton growers in New Mexico and the higher elevations of Arizona have been more hesitant to adopt this practice because of their shorter growing season. In all areas, however, success with defoliation has been variable. Some of the factors which help determine the success or failure of a defoliation job follow.

Plant Condition

Plants that get off to a good start in the spring, grow well throughout the season, and are in cut-out but still active at the time of defoliation are most apt to respond satisfactorily to chemical defoliation. Soil conditions, uniformity of stand, irrigation, fertilizer, insect control and weed infestations all play a part in determining plant condition.

Land and soil conditions. For best results in production and defoliation, cotton should be planted on relatively uniform land which has been properly graded to permit adequate and even water penetration. Unfortunately, this is not always possible, as western cotton growers are often plagued with diverse soil conditions which result in uneven plant growth and maturity. For example, soil in one block at the Cotton Research Center near Phoenix is progressively finer textured from the south to the north side of the field. When a chlorate-type defoliant was applied last October, plants on the south side were in an ideal condition for defoliation and leaf drop was excellent. On the north side of the same field, plant height averaged almost 2 feet greater, plants were still growing actively, and leaf drop was very poor. In this field, as in many others, the areas were too irregular to permit special fertilization, irrigation, etc. Any practice, such as turning under manure or crop residues, which will help to "even out" plant growth also will make defoliation less chancey.

Stand. Defoliation is easiest in even stands with uniform plant development and maturity. If a stand is uneven and plant development and boll maturity are irregular, defoliation also will probably be irregular and incomplete.

Irrigation. A cotton crop should be provided a consistent, adequate supply of moisture during its growing and fruiting life. Delay of a single irrigation at a critical period may lead to unsatisfactory results when defoliation is attempted. Excessive irrigation and fertilization may lead to lush, rank growth, defoliation difficulties, and troublesome regrowth.

The last irrigation is the most important moisture factor relating to defoliation. The last irrigation should be timed to permit bolls to mature before temperatures are too low for effective defoliation (or before the expected date of first killing frost if defoliation is not planned), but with sufficient moisture remaining to maintain active plants at the time of defoliation. It is impossible to specify an exact date for the final irrigation as this will vary with soil type, expected fall temperature, etc.

Fertilization. Sufficient, but not excessive, amounts of fertilizer should be provided for cotton. Adequate fertilization is needed to insure continuous plant development and top yields. Too much fertilizer, especially nitrogen, can result in rank growth, leaves which will not defoliate, late immature bolls, and a regrowth problem. Nitrogen applications made too late in the season can cause similar difficulties.

As with irrigation, it is impossible to specify a "best" rate of fertilization or a "best" time to apply fertilizer. In general, however, 50 to 200 pounds of nitrogen per acre are adequate under Arizona conditions, and applications later than July should be avoided.

Insect Control. Serious insect injury can cause defoliation problems as well as reduced yields. For example, early insect damage which knocks off the squares through June will result in a delayed fruit

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Presented at the Western Cotton Production Conference, March 7-8, in Phoenix, Ariz.

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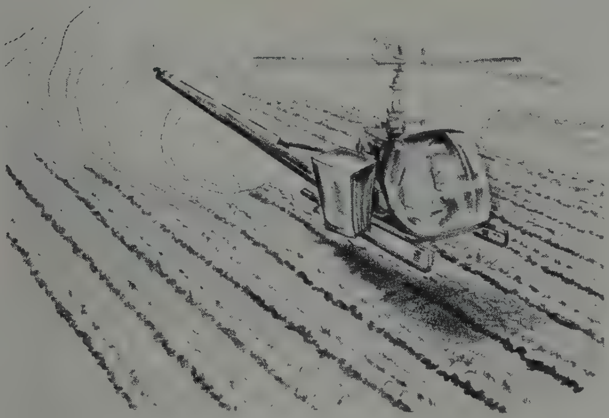

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set, rank growth, and delayed maturity in the fall.

Weeds. It is difficult to obtain uniform leaf coverage with defoliants on fields that are heavily infested with weeds. Also, vigorously growing weeds may not be affected by defoliating chemicals and, consequently, will interfere with machine harvest.

Temperature

Defoliants should be applied when temperatures are relatively high to obtain the best and most rapid leaf drop. Successful defoliation is very difficult to achieve when maximum daily temperatures average below 60 to 65 degrees F. Also, night temperatures below 55 degrees F. are not conducive to good defoliation.

Timing

Applying defoliant too early will result in the loss of top immature bolls, or, at least, cotton from such bolls will be inferior in quality and yield. Applying defoliant while plants are growing rapidly and have many immature leaves will result in a poor leaf drop. Applying defoliant too late may result in a poor leaf drop due to low temperatures. Applying defoliant to too large an acreage at the same time may result in serious regrowth in some fields before they can be harvested. *Timing is important.*

Maturity. In a boll that requires 50 days to progress from open bloom to open boll, 18 days are required for full development of fiber length, and 45 days are required for full development of strength, thickness, and boll weight.[1] It might be expected, therefore, that defoliation which stops development earlier than about 45 days could have deleterious effects on certain fiber properties.

At Shafter, California, investigations by Walhood[3] did indicate a critical point with regard to effect of age of boll when treated. Defoliation of plants with 41-day and older bolls caused no significant change in boll weight and seed weight, but treatment when bolls were between 32 and 41 days old caused up to 18 percent reduction. Up to 44 percent reduction in boll weight and seed weight resulted from treatment of 25- to 31-day old bolls. Under California conditions, where leaf injury usually is evident 2 to 3 days after application of a defoliant, Walhood[4] has since found that immature bolls continue to develop about 5 days following application.

Defoliation Rules

(1) Plan each operation carefully to obtain a uniform stand, provide adequate but not excessive irrigation and fertilization, and achieve control of insects and weeds;

(2) Check for boll maturity to be sure that yield and fiber quality are not sacrificed;

(3) Stagger defoliant applications so that cotton can be picked before regrowth is a problem; and

(4) Apply the recommended amount of material when conditions are favorable.

In general, then, about 35 to 40 days after open bloom are required for cotton bolls to mature to the point that defoliation will cause little or no damage to yield or boll and fiber properties. The exact time will vary with temperature and other factors. The cotton should be checked. Mature bolls feel firm when pressed between thumb and forefinger, and they cannot be sliced easily with a sharp knife (the fiber strings out). If the youngest bolls are in this condition, it is safe to defoliate.

Harvest Program. Harvest facilities should be considered in deciding when to defoliate. Mature bolls open rapidly after the leaves fall. If harvest does not follow very soon, tender regrowth may become a serious problem. For this reason, defoliant applications should be staggered if harvest facilities are limited.

The final decision on when to apply a defoliant must be made by each grower considering plant condition, maturity, weather, and the harvest program.

Coverage

Each cotton leaf must be covered with defoliant to promote a good leaf drop. When applying by air, a flagman should be used to insure complete coverage.

Multiple treatments may be necessary in rank cotton. In the West, two applications about 10 days apart of a chlorate-type defoliant have been used by many growers. In some instances, an application of chlorate-type defoliant has been followed by application of a desiccant such as pentachlorophenol.

Materials

Phosphate defoliants were used in Arizona during the 1960 season for bottom and early complete defoliation while temperatures were high. Chlorate-type defoliants were more widely used overall, however, especially during the latter part of the season. Both types of material provide satisfactory defoliation when used under the proper conditions. None of the available materials are completely satisfactory under the wide variety of conditions which exist each fall, however.

Preliminary work at the Cotton Research Center near Phoenix in 1960 indicated considerable promise for a combination defoliant-desiccant application. Very good success was obtained late in the season, but it will be necessary to repeat the work this year to determine effectiveness earlier in the harvest season.

Whatever material is used, directions for its use should be checked carefully. Generally speaking, lower rates will be required for small plants during warm weather, and higher rates will be required on large plants during cool weather.

Regrowth

As has already been mentioned, regrowth can be a serious problem if moisture and nitrogen

(*Continued on Page* 96)

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AG CHEM PEST ROUNDUP

by Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U. S.

Greenbugs On Buildup Throughout Oklahoma

BY the latter part of March, greenbugs were affecting small grains throughout Oklahoma. Despite widespread rains over the state during the period March 16-19, severe infestations became more common in the affected areas than in previous weeks. Greenbug damaged spots were noted in 40-50 per cent of the small grain fields checked in Love and Marshall Counties, Oklahoma. They were common in many fields in the central area of the state, and were beginning to appear in the north central area. Twenty per cent of the fields in Bryan County were reported to have been treated throughout the week ending March 24, and controls were needed in most affected sections.

Greenbug populations in the panhandle and Red River areas of Texas ranged from light to heavy. Controls were applied in many instances, but more extensive application was needed. Counts up to 2,000 per linear foot of row were found in Potter, Gray, Carson, Randall, Swisher, Oldham, and Hardeman Counties. Local, heavy populations were damaging volunteer wheat in the Denton and Wichita Falls areas. In some sections of the state, lacewings and other beneficial insects were beginning to appear.

Populations of the greenbug were relatively light in New Mexico and Kansas during March. In DeBaca County, New Mexico, the insect averaged 1-5 per linear foot in fields checked. Counts in the Tucumcari area, Quay County, average 3-28, with an occasional heavier, spotty infestation. Curry and Roosevelt Counties had much lighter counts and only an occasional speciman was found in Lea and Eddy Counties. In southeastern Kansas, counts ranged 0-100 per 100 sweeps in fields of wheat and barley.

During the early part of March the English grain aphid was the most commonly found small grain insect in 25 north central, central and southern Texas counties. In Oklahoma, the insect was common on small grain throughout the state, but counts remained fairly uniform with no particularly high populations reported.

The pea aphid continued to cause concern during March in several states. In Arizona, infestations increased on alfalfa throughout the state and populations were heavy in some areas. Heavy populations on alfalfa were reported from Dona Ana and Roosevelt Counties, New Mexico. Counts averaged 50-100 per sweep in Brazos County, Texas, on alfalfa and very heavy infestations in Denton and Wichita Falls areas were causing farmers to become concerned.

Trace to light populations of the pea aphid were found on alfalfa in the Reno-Sparks area of Washoe County, Nevada. Scarce populations were reported from eastern Sussex County, Delaware. Idaho reports that it appears likely the pest will be abundant on alfalfa again in 1961 and damage may be experienced in some southern areas of the state.

The alfalfa weevil was rather active in several states during March. Moderate to heavy populations were reported from several Georgia counties, but treated fields showed very little feeding injury. Light populations were reported from several east Tennessess counties. Washington and Unicoi counties were reported infested for the first time. Damage was reported from untreated alfalfa fields in Laurene County, South Carolina, and plans were underway to apply insecticides to Oconee County fields. In Anderson County, insecticidal controls gave varying results. Light activity of alfalfa weevil larvae was reported in Virginia, Maryland, and Delaware by the latter part of March.

Adult alfalfa weevils were active on warm days in the Arkansas River Valley of Colorado by mid-March. Controls for the weevil were applied on south and west sloping farms in a number of northern and central Utah counties. Egg laying was in progress in northwestern Nevada. Adults were active in fields of alfalfa in the Lewiston area of Nez Peree County, Idaho, but no egg laying had been noted.

The Egyptian alfalfa weevil was heavy on alfalfa on the Yuma-mesa of Yuma County, Arizona. Damage was heavy in many fields and second insecticidal applications were necessary. Light to medium infestations were present

(*Continued on Page* 86)

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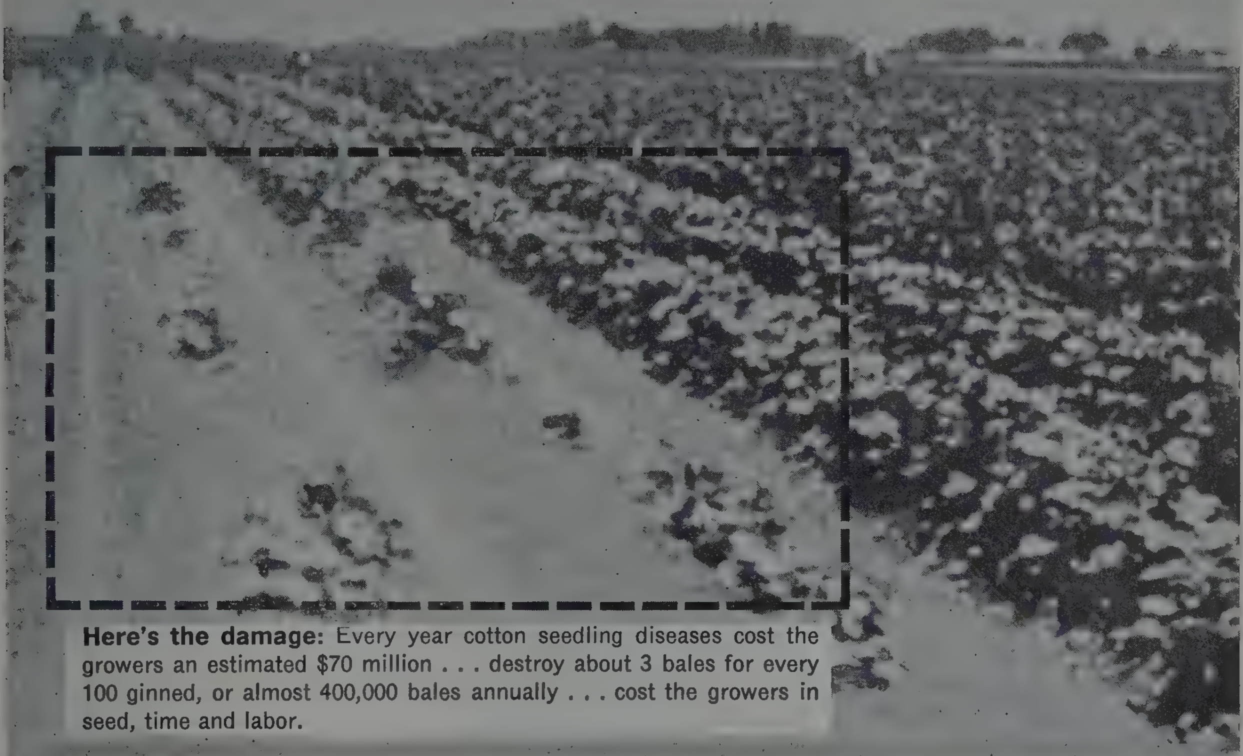

Here's the damage: Every year cotton seedling diseases cost the growers an estimated $70 million . . . destroy about 3 bales for every 100 ginned, or almost 400,000 bales annually . . . cost the growers in seed, time and labor.

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10. Permits earlier harvest . . . and better grade of cotton if harvested before Fall rains.
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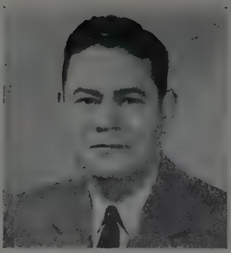

by Paul Miller

This department, which reviews current plant disease problems, is a regular feature of AGRICULTURAL CHEMICALS. The comments are based on observations of collaborators of the Epidemiology Investigations, Crops Protection Research Branch, USDA, Beltsville, Md.

Control Of Strawberry Red Stele With Soil Fungicides

R. H. Converse (1), of the Crops Research Division, Agricultural Research Service, United States Department of Agriculture, compared results obtained from a number of chemicals applied as postplanting and preplanting soil fumigants for the control of the strawberry red stele disease, caused by the soil-borne fungus *Phytophthora fragariae.* Effectiveness of the treatments was rated according to severity and percentage of infection one year after treatment.

For the postplanting treatment tests, Converse used uniformly infected plots in an established strawberry field. Disodium ethylene bisdithiocarbamate (nabam 22%; Dithane D-14) and tetramethylthiuram disulfide (thiram 75%; Tersan) were applied to the soil around the plants. Nabam reduced red stele somewhat but not enough to be of practical value. It killed about half the plants and weakened the rest. The tests did not indicate that Nabam possessed chemotherapeutic properties or had effective eradicative action. Thiram did not control red stele but was not phytotoxic.

The chemicals used in the preplanting-treatment experiments were a mixture containing 85% propargyl bromide, 31% chloropicrin, and 61% methyl bromide (Trizone); 32% sodium n-methyl dithiocarbamate (Vapam); a mixture of 98% methyl bromide and 2% chloropicrin (Dowfume MC-2); and 99% chloropicrin (Picfume). The materials were applied to soil in undisturbed rows of infected plants. Fourteen days later, strawberries were planted in beds prepared in the treated soil. All four materials reduced both severity and amount of infection. Trizone gave best control, and that by Vapam followed; both these materials greatly reduced the amount of red stele. In the chloropicrin plots strawberries planted 14 days after treatment died, and plants set one month after treatment were dwarfed and slow in growth. None of the other materials used in the preplanting tests caused injury.

Methods of Application

S. D. Van Gundy (3), of the University of California, Riverside, F. J. Foote, of the Limoneira Ranch, Santa Paula, California, and R. L. Rackman and F. J. Foote, also of the University of California, compared three different methods of applying emulsifiable 1, 2-dibromo-3-chloropropane (DBCP) in irrigation water to soil around living citrus trees for control of the citrus nematode, *Tylenchulus semipenetrans.* According to Van Gundy and his associates, application of DBCP in water is preferable to injection for perennial plants, provided nematode control is comparable. The cost of water application is usually less, a greater area can be treated, and the tree roots suffer less disturbance.

In the tests, different amounts of DBCP were applied by overhead sprinklers, by furrow irrigation, and by basin irrigation. Extent and uniformity of distribution of the chemicals at various depths in the soil were determined by measuring the growth of onion seedlings, which react to very small drops of DBCP, in soil samples taken seven days after treatment, and by counting citrus nematode larvae in samples taken four months after treatment.

Application by means of overhead sprinklers did not give satisfactory results. DBCP was uniformly distributed in the middles of the rows and in the drip lines of the trees, but none was detected in samples taken from under the trees.

In furrow irrigation the uptake and infiltration of water and consequently the distribution of DBCP were greatly affected by soil texture. The chemical was more uniformly distributed and reached greater depths in coarse-textured than in fine-textured soil. In general, furrow irrigation was considered unsatisfactory for applying DBCP.

Most uniform distribution of DBCP and most effective control of nematodes resulted from application by irrigation in basins around the trees. The use of more water than would ordinarily be applied during regular irrigation carried the chemical to greater depths in the soil. Van Gundy and his associates concluded that basin irrigation was the best of the three methods tried for applying emulsifiable DBCP in irrigation water, since it resulted in most uniform distribution of the chemical, provided treatment of the entire area

(*Continued on Page* 85)

Arcadian News

Volume 6 Nitrogen Division, Allied Chemical Corporation Number 5

THE ADVANTAGES OF 20% SUPERPHOSPHATE IN MIXED FERTILIZERS

20% superphosphate is the key to the great progress which has been made in the manufacture of mixed fertilizers in this country. Manufacturers began to supply farmers with better fertilizers when industry research developed:

1. The production of 20% superphosphate by the acidulation of phosphate rock.
2. The production of nitrogen solutions for the ammoniation of 20% superphosphate to provide an economical base for mixed fertilizers.

20% superphosphate is the heart of a successful fertilizer technology which has supplied American farmers with millions of tons of efficient crop-producing power at low cost.

New gimmicks have come along for making fertilizers. New and more concentrated phosphorus carriers have been developed. But, no new method has been devised that will produce better quality fertilizers at lower cost than the technology which centers on the ammoniation of 20% superphosphate.

In the first place, 20% superphosphate has many basic advantages over other more concentrated phosphorus carriers. It is a lower cost source of phosphorus and it contains large quantities of gypsum (discussed elsewhere in this issue of ARCADIAN News).

Ammoniation of superphosphate has become the mainstay of the fertilizer industry since the creation of nitrogen solutions by Allied Chemical Corporation in 1929.

20% superphosphate supplies phosphorus that remains in the soil available to plants over a longer period than phosphorus from more concentrated carriers which have a tendency to become fixed in the soil in compounds that cannot be used by plants.

20% superphosphate will absorb more low-cost nitrogen through ammoniation with low-cost nitrogen solutions than will more concentrated phosphorus carriers. Low-cost 20% superphosphate and low-cost nitrogen solutions have enabled fertilizer manufacturers to supply farmers with low-cost, high-quality fertilizers.

Industry research with ammoniated superphosphate has helped in the improvement of the condition of all types of fertilizers and helped in the development of granular fertilizers.

As long as fertilizer manufacturers continue to make the largest possible utilization of 20% superphosphate and high levels of ammoniation, the situation favorable to the increased use of mixed fertilizers will exist and flourish.

Arcadian® News *for Fertilizer Manufacturers from* **Nitrogen Division, Allied Chemical**

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The most economical way to put nitrogen into mixed fertilizers is through the ammoniation of 20% superphosphate with nitrogen solutions. This tried and proven technique has been used with outstanding success by many manufacturers for many years.

Through the years, the technology of ammoniation has been constantly improved by the development of modern methods and the introduction of new types of ARCADIAN® Nitrogen Solutions. The result is more efficient production of better fertilizers.

Higher and higher levels of nitrogen take-up by superphosphate have been achieved. The standard rate at one time was 3 pounds of ammonia per unit of P_2O_5. Today it is common practice for one unit of P_2O_5 in 20% superphosphate to accommodate 5½ to 6½ pounds of free ammonia, without the aid of acid or the loss of nitrogen. A big tonnage of good fertilizer is being made with ARCADIAN Nitrogen Solutions supplying 1 unit of nitrogen for each 2 units of P_2O_5.

Through the use of acid, much higher rates are obtained. Some fertilizer manufacturers use this practice to produce 10-10-10 fertilizer with all the nitrogen from solutions.

High take-up of free ammonia by superphosphate is usually desirable in the manufacture of any mixed fertilizers. It is particularly desirable in the production of granular fertilizers. A high rate of ammoniation not only adds large quantities of low-cost nitrogen, it also generates heat at an opportune time in granulation.

Ask Allied Chemical

Efficient ammoniation involves proper technique, equipment and materials. There is a complete line of ARCADIAN Nitrogen Solutions from which you can make selections adapted to your particular conditions.

Nitrogen Division technical men are experts in ammoniation. Their advice is free to customers. Contact: Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N. Y.

Ammoniated Superphosphate Contains Four Plant Foods

You ammoniate 20% superphosphate to put nitrogen and phosphorus in your fertilizer. But, don't forget, you also include large quantities of sulphur and calcium. In fact, 20% superphosphate contains more sulphur and more calcium than phosphorus.

Other more concentrated sources of phosphorus, such as triple superphosphate and ammonium phosphate, are deficient in calcium and sulphur because the gypsum has been removed.

It will pay you to tell farmers about the two bonus plant foods they get in your mixed fertilizers made with 20% superphosphate. For every unit of phosphorus in 20% superphosphate, you give the farmer 137 pounds of gypsum (calcium sulphate).

Both the calcium and the sulphur in gypsum are valuable plant foods. In addition, gypsum is an excellent soil conditioner, widely used to improve water penetration in tight soils. Farmers use hundreds of thousands of tons of gypsum each year in addition to the gypsum they get in superphosphate.

You charge your customers for the nitrogen, phosphoric acid and potash in your mixed fertilizer. When you use ammoniated superphosphate, you also give them calcium, sulphur and a soil conditioner at no extra cost except for transportation.

The value of calcium in fertilizer is well known. Calcium is an essential plant food. It also helps to counteract the effect of low pH. Many crops grow well at a low pH when they have an adequate supply of calcium from gypsum.

The value of sulphur in fertilizer is demonstrated by the fact that crops, on the average, remove about as much sulphur from the soil as they do phosphorus. Yet the average soil contains only half as much sulphur as phosphorus.

With the increase in the use of sulphur-deficient triple superphosphate and ammonium phosphate in concentrated fertilizers, much land gets little sulphur. The lack of this secondary plant food element is more and more apt to limit crop yields and profits.

Critical Sulphur Shortage

The shortage of sulphur is becoming critical for many crops on many soils. Cotton, corn, tobacco, legumes, grass, onions and cabbage are heavy users of sulphur. Field tests in many areas now show definite response of crops to additional sulphur.

Symptoms of sulphur deficiency appear in corn and other crops as pale green leaves, not to be confused with the drying up of older, lower leaves, typical in nitrogen deficiency. Sulphur is needed to produce the essential amino acids that go into making the protein of plant cells.

Sulphur is required for good nodule formation on legume roots. With cotton, lack of sulphur reduces number of bolls matured, rate of growth and yield of seed cotton. On an elemental basis, the

Cotton is a heavy user of sulphur. So are corn, legumes, onions and cabbage. Many soils are running out of sulphur fast!

corn plant actually uses as much sulphur as it does phosphorus. A 100-bushel crop requires 160 pounds of nitrogen, 25 pounds of elemental phosphorus, 100 pounds of potassium, and 25 pounds of sulphur.

Sulphur leaches out of the soil almost as fast as potash or calcium, and it needs to be applied frequently. In the past. sulphur requirements of plants have been largely ignored because most fertilizers have carried substantial amounts of sulphur along with nitrogen, phosphorus and potash.

All of the available evidence builds up an impressive case for continuing to supply sulphur in mixed fertilizers. When you ammoniate superphosphate for your mixed fertilizers, you are giving farmers a bargain in free sulphur, calcium and soil conditioner. You and your dealers will benefit by telling farmers about these bonus values.

PLEASE DO NOT HOLD TANK CARS TOO LONG

Nitrogen Division, Allied Chemical Corporation, is doing its utmost to keep its delivery facilities operating at top efficiency during this period of peak demand for nitrogen. Extra effort is being exerted to keep tank cars rolling to your plant to supply you with ARCADIAN® Nitrogen Solutions when you want them.

The only thing that can interfere with this service is a shortage of tank cars. Despite the fact that Nitrogen Division is operating more tank cars than ever before, if too many fertilizer manufacturers hold too many tank cars too long. a shortage may cause slow deliveries.

You can cooperate by returning empty tank cars as quickly as possible. A tank car sitting idle on your siding—or anyone else's—can't also be back at the nitrogen plant taking on that rush order you just placed. So unload tank cars as fast as you can and return them.

You cannot mix and ship tonnage on schedule if you are waiting for nitrogen solutions. And Nitrogen Division, Allied Chemical Corporation, cannot ship solutions on schedule if tank cars are not available. Don't hold tank cars! Keep 'em rolling to serve you!

Complete Fertilizer Service Builds Exclusive Customers

Everyone who sells fertilizers wants plenty of exclusive customers. The best way to build customer loyalty is to be prepared to supply all of the mixed goods analyses and straight materials the farmer needs and wants. You are in danger of losing a customer when you provide only part of his plant food needs and force him to go elsewhere to buy what you do not sell.

You can't help but benefit when your customers make you their headquarters for all their fertilizer requirements. It pays to establish your prestige and your leadership as a dependable, one-stop, full-line source of supply.

You will find it profitable to study market trends so that you can anticipate demands and be prepared to supply these demands. Three important trends are now evident in fertilizer consumption figures: **1.** The growth in the use of high-nitrogen fertilizers. **2.** The fact that more nitrogen is sold as straight materials than in mixed fertilizers. **3.** The rapid increase in the use of nitrogen solutions for direct application.

Experiment Stations are recommending more and more nitrogen for crops. Corn and several other major crops require more nitrogen than any other plant food. More and more farmers are testing their soils and they know their needs.

For many crops and soils, farmers have found that it pays to use more than one application of nitrogen. They apply part of their nitrogen in mixed fertilizers and part of it in one or more separate applications of straight material.

Sell straight nitrogen materials along with your mixed fertilizers and you increase your sales and your profits. There was a time when straight nitrogen materials did not offer an attractive profit margin to fertilizer manufacturers. But the situation is different today, particularly in the case of ARCADIAN® Nitrogen Solutions for direct application.

Some fertilizer manufacturers are finding that they make bigger profits from ARCADIAN Golden URAN®, ARCADIAN FERAN® and ARCADIAN NITRANA® than they make from mixed fertilizers.

When you sell ARCADIAN nitrogen materials (liquid and dry) for direct application, you help farmers to get better yields and insure that response to your mixed fertilizers will not be limited by lack of nitrogen. You sell a bigger tonnage of plant food and you build farmers into exclusive customers for you and your dealers.

You will find it profitable to let Nitrogen Division, Allied Chemical, work with you in helping you to offer your customers a complete line of mixed fertilizers and straight nitrogen materials.

Many different ARCADIAN Nitrogen Solutions are available for the manufacture of every mixed fertilizer analysis now in demand. Many different ARCADIAN Nitrogen Products (liquid and dry) are also available to sell to farmers for direct application.

Start now to make ARCADIAN Nitrogen a sales builder for you. Contact: Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N. Y. Phone: HAnover 2-7300.

Arcadian® NITROGEN SOLUTIONS

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60° F	Approx. Vap. Press. at 104° F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	–25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	–36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	–30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	–52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	–15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	– 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	–17
DURANA®									
DURANA contains 8% formaldehyde.	37.0	13.3	53.4	15.9	9.4	7.2	1.235	0	36
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	–108

Other ARCADIAN® Products: URAN® and FERAN® Solutions • Ammonia Liquor • N-dure® A-N-L® • Ammonium Nitrate • UREA 45 • Nitrate of Soda • Sulphate of Ammonia

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

Allied Chemical

NITROGEN DIVISION

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Ironton, Ohio, P. O. Box 98 ....Drexel 7-4366
Omaha 7, Neb., P. O. Box 166.........................29 1-1464
Raleigh, N. C., 606 Capital Club Bldg.....Temple 3-2801
Columbia 1, S. C., 1203 Gervais St...........Alpine 3-6676
Atlanta 3, Ga., 127 Peachtree St., N. E...Jackson 2-7805
Memphis 9, Tenn., 1929-B South 3rd St. Whitehall 8-2692
Indianapolis 20, Ind., 6060 College Ave...Clifford 5-5443
San Francisco 4, Cal., 235 Montgomery St...Yukon 2-6840

NEWS ABOUT THE AG CHEM TRADE

ASA Executive Secretary

Dr. Matthias Stelly, formerly professor of soils at Louisiana State University, has been named executive secretary of the American Society of Agronomy, Madison, Wis. Dr. Stelly succeeds L. G. Monthey, who had served as ASA executive secretary since January 1948 and who now is an extension resource development specialist with the University of Wisconsin. Dr. Stelly taught soils at the University of Georgia from 1946 to 1957. In 1952-53, he worked in Kenya, East Africa, as a soil specialist with the British Colonial Office. In 1957, Dr. Stelly joined the staff at Louisiana State University as head of soil testing and then as professor of soils specializing in teaching and research in soil chemistry.

•

John H. Kennedy Retires

John H. Kennedy, a pioneer in the agricultural chemicals business, is retiring this month from his position as assistant to the vice president, Agricultural Chemicals Division, Stauffer Chemical Co.

Mr. Kennedy has spent more than 45 years in industrial and agricultural chemical sales. He was Stauffer's eastern sales manager for agricultural chemicals for 20 years. He also has served on the board of directors of the National Agricultural Chemicals Association.

On retirement, Mr. Kennedy plans to "actively relax" as resident manager of Zipse's East Lake Fishing Camp, Oakland, Me. The camp is owned by Bob Zipse, former Olin Mathieson sales manager.

•

Trona Prices Raised

An increase of three cents per unit of K_2O for agricultural grades of American Potash & Chemical Corp. muriate and sulfate of potash will become effective July 1.

The new prices for Trona muriate of potash will range from 44 cents to 48½ cents per unit of K_2O, depending upon time of delivery. Prices for Trona sulfate of potash will range from 76 cents to 84 cents per unit of K_2O.

•

Heads Western States Chem.

R. H. McGough has been appointed president of Western States Chemical Corp., Los Angeles. He had been general manager of agricultural chemical sales for Collier Carbon and Chemical Corp.

John A. Foster has been named by Collier to succeed Mr. McGough.

•

Manns Joins Great Lakes

Marshall M. Manns has joined the Great Lakes Chemical Corp., Los Angeles, Calif., as manager of agricultural chemical sales. He is stationed at the company's Kansas City, Mo., office.

Prior to joining Great Lakes, Mr. Manns' sales activity had been Gough.
focused on the various uses of methyl bromide mixtures for control of insects in stored grain.

Products newly added to the Great Lakes line include GL37 and GL73, which are combinations of fumigants incorporating varying percentages of ethylene dibromide and methyl bromide.

•

Grace Expands Facilities

A 6,000-square-foot New Product Development building has been erected at W. R. Grace & Co.'s central research facility in Clarksville, Maryland, to handle the expanded activities of the New Products Development and Agricultural Chemicals Research departments.

Radden Joins Foxboro

Charles O. Radden has been named to the newly-formed marketing division of The Foxboro Co., Foxboro, Mass. He is in charge of chemical industry promotion, both for the United States and the international markets.

Prior to joining Foxboro, Mr. Radden had been with the nuclear marketing section of United Shoe Machinery Corp. His previous experience includes positions with E. I. du Pont de Nemours & Co., Wilmington, Del., Monsanto Chemical Co., Everett, Mass., and Arthur D. Little Co., Cambridge, Mass.

•

Co-op Buys Fertilizer Plant

Mississippi Federated Cooperatives, Jackson, Miss., has purchased a fertilizer plant at Hattiesburg, Miss. The co-op will spend about $200,000 to modernize the plant and will manufacture pelleted lime-base fertilizer.

•

To Spend $30 Million

Texas Gulf Sulphur Co., New York, plans to spend $30,000,000 on its new potash mining and processing plant now being constructed in southeastern Utah, near the town of Moab. The plant is designed to produce at the outset 1,100,000 tons of potash annually. Construction has begun on the mine shaft, and the plant is scheduled to begin operations by the end of 1962.

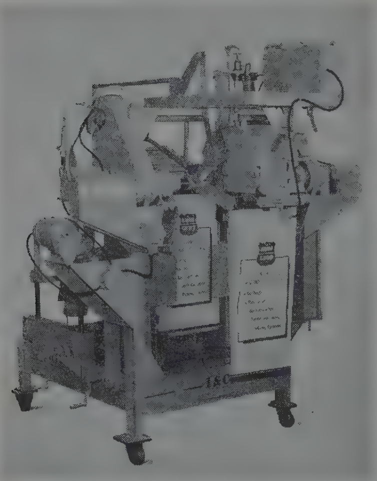
Texas Gulf has awarded to Harrison International, Miami, Fla., the shaft-sinking and underground construction contract for development of the potash beds. A contract for building a milling plant and other surface facilities previously was awarded to Sterns-Rogers Mfg. Co.

Why are more and more feed packers using Union-Camp I&C bagging equipment?

Over 1000 Union-Camp I&C installations have been made in the last six years. Here are 8 reasons behind their astonishing popularity.

1. Reduced Packaging Costs. I&C's pay for themselves. Their fast, *automatic* operation reduces packaging and labor costs, increases profitability. Dozens of repeat orders attest to their efficiency and economy.

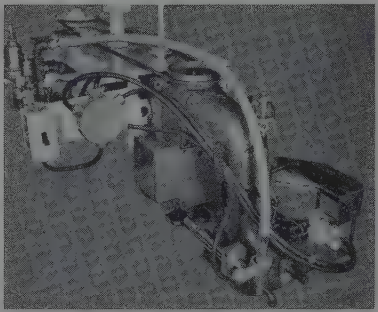
2. 20-a-Minute—and More. The Union-Camp I&C Bagger was the first machine to introduce high-speed filling of open-mouth multiwall bags. Speeds well in excess of 20 bags per minute can be sustained, depending on the flow of the product.



I&C Automatic Bag Hanger speeds bagging operation by automatically supplying empty SOM multiwalls to bag-filling machine.

3. Outstanding Flexibility. With the versatile I&C, you can make weight changes from 25 to 200 lbs.—with just a turn of a scale dial knob! No bag clamp is necessary.

4. Accurate. The I&C *automatically* pre-weighs the net amount of material before it is dumped in the bag. At speeds of 20 bags a minute and more, weight variation is within *plus or minus 2 ounces* on 100 lb. packages of uniform granular or pelletized products.



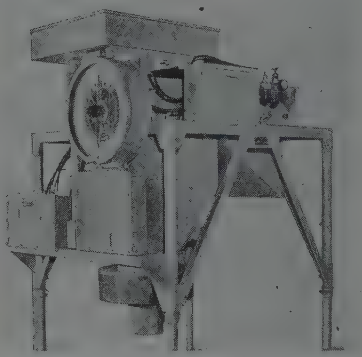
The I&C Acto-Cutter automatically starts and stops sewing action and cuts threads between bags. An outstanding time and labor saver.

5. Low Maintenance. Simplicity of design is a major feature of I&C equipment. Another is sturdy construction. Many packers report low maintenance cost a key factor in their selection and repurchase of I&C bagging equipment.

6. Cuts Production Time—Speeds Service. With the I&C you can bag and ship required tonnages faster. There is usually little or no downtime. Thus you speed customer service and delivery, reduce costly overtime.

7. Labor-Saving Accessories. There is a wide range of machine models plus many cost-cutting auxiliaries. These include sewing machine lubrication systems, dual head sewing stand, automatic actuators and thread chain cutters—everything you need to streamline your multiwall bagging operation.

8. Valuable Survey Service. Union-Camp package machinery specialists make comprehensive surveys of your plant. They make up exact machinery and installation specifications and layouts. They train operating personnel, help determine the actual savings for your operation. All at no cost or obligation.



Newest I&C Bagger—the UB-101. Machine's features include dial scale which provides for instantaneous weight changeovers from 25 to 200 lbs. with a turn of a knob.

FREE BOOKLETS

Get the complete story of the profit opportunities I&C equipment offers you. We'll be glad to send you free booklets illustrating and describing our complete line of machine models and accessories. Write Dept. A-1 today, or contact your nearest Union Bag-Camp Paper multiwall representative.

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Esterhazy Potash Mine Shaft Lining Is Completed

The cone-shaped structures are huge storage buildings at the Esterhazy potash mine. Tall structure in center cluster of buildings is headframe over the mine shaft.

A 3,000-ton cast-iron lining which walls off the 200-foot Blarimore stratum of the International Minerals and Chemical Corp. (Canada) Ltd. potash mine shaft 12 miles north of Esterhazy, Saskatchewan, has been completed. The lining is 350 feet long and is made up of 76 iron rings.

The lining is expected to end the problem of water seepage that has stymied the development of the potash reserve. The Blairmore stratum is a geological stratum that carries oil in some areas, coal in others, and water under extremely high pressures in others. It is composed of water-bearing sand and clay layers where it occurs between the 1,240 and 1,439 foot levels at Saskatchewan. The shaft was sunk through the stratum by Associated Mining Construction Ltd., a group of four German shaft-sinking companies.

The potash beds are located at 3,150 feet and limestone formations in the last 1,600 feet are expected to present no unusual problems. Initial production is expected during the fiscal year ending June 30, 1962.

A pilot surface plant for initial production already is virtually completed and can handle about 420,000 tons of product annually. This capacity will be more than doubled by a planned addition, construction of which is expected to be scheduled this summer.

Cotton Responds To Potash

When potash fertilizers were applied, cotton yields increased significantly in some fields of California's San Joaquin Valley, L. K. Stromberg, Fresno County Farm Advisor, told the 1961 Potash Review Meeting in Fresno last month. The meeting was sponsored by the American Potash and Chemical Corp.

Potash deficiency symptoms—which include premature wilting of leaves, becoming thick, leathery, and brittle and eventually dying and falling off the plants — were observed when plants were about 120 days old, Mr. Stromberg reported. Cotton plants adequately supplied with potash, he said, are soft and should feel like suede.

When fertilizer containing 245 pounds of potash per acre was applied to experimental plots in 1959, he said, potash deficiencies cleared up and yields of lint cotton increased an average of 207 pounds per acre. "It was interesting to note," he continued, "that plots receiving fertilizer containing 245 pounds of potash per acre in 1959 and an additional 250 pounds in 1960 yielded 106 pounds more lint per acre than plots receiving only the 250 pounds of potash in 1960."

•

USDA OK's Butonate Label

Butonate, an insecticide developed by the Wisconsin Alumni Research Foundation, has been approved by the U. S. Department of Agriculture for use in aerosol, space, and direct sprays against household insects. A license to manufacture and distribute Butonate previously had been granted by Wisconsin Alumni to Prentiss Drug and Chemical Co., New York.

In addition to its use as a household insecticide, a number of other applications for Butonate are being investigated in the field, particularly for the control of insects affecting livestock.

Chemically, Butonate is o,o-dimethyl 2,2,2-trichloro-1-n-butyryl-oxyethyl phosphonate. It is a cholinesterase inhibitor. As previously reported in *Agricultural Chemicals* (June, 1960, page 90B), Butonate has been tested against adult pea aphids, against the larvae of the southern army worm and Mexican bean beetle, and against *Tetramychus atlanticus mites.* It may be formulated as an oil spray, an emulsion, wettable powder, or dust.

•

Symposium On Residues

A symposium on the analysis, degradation, and metabolism of pesticide residues has been arranged as Section C3 of the Analytical Chemistry program of the 18th International Congress of Pure and Applied Chemistry, to be held in Montreal, Canada, August 6 to 12. The symposium will be held August 7, 8, and 9.

Among the speakers will be Dr. R. D. O'Brien, Cornell University, Ithaca, New York, "Molecular configuration and activity of pesticides as related to degradation and metabolism," F. P. W. Winteringham, Pest Infestation Laboratory, Slough, U. K., "Tracer techniques for determination of the chemical fate of insecticides," Dr. S. Dormal, Centre de Recherches de Phytopharmacie, Gembloux, Belgium, "Comparative methods of residue analysis," and Dr. W. E. Westlake, USDA, Beltsville, Md., "Objectives and progress in regional pesticide residue projects in the U. S."

Twenty-four other papers and contributions are to be presented by speakers from the United States, France, England, Italy, Yugoslavia, and Canada.

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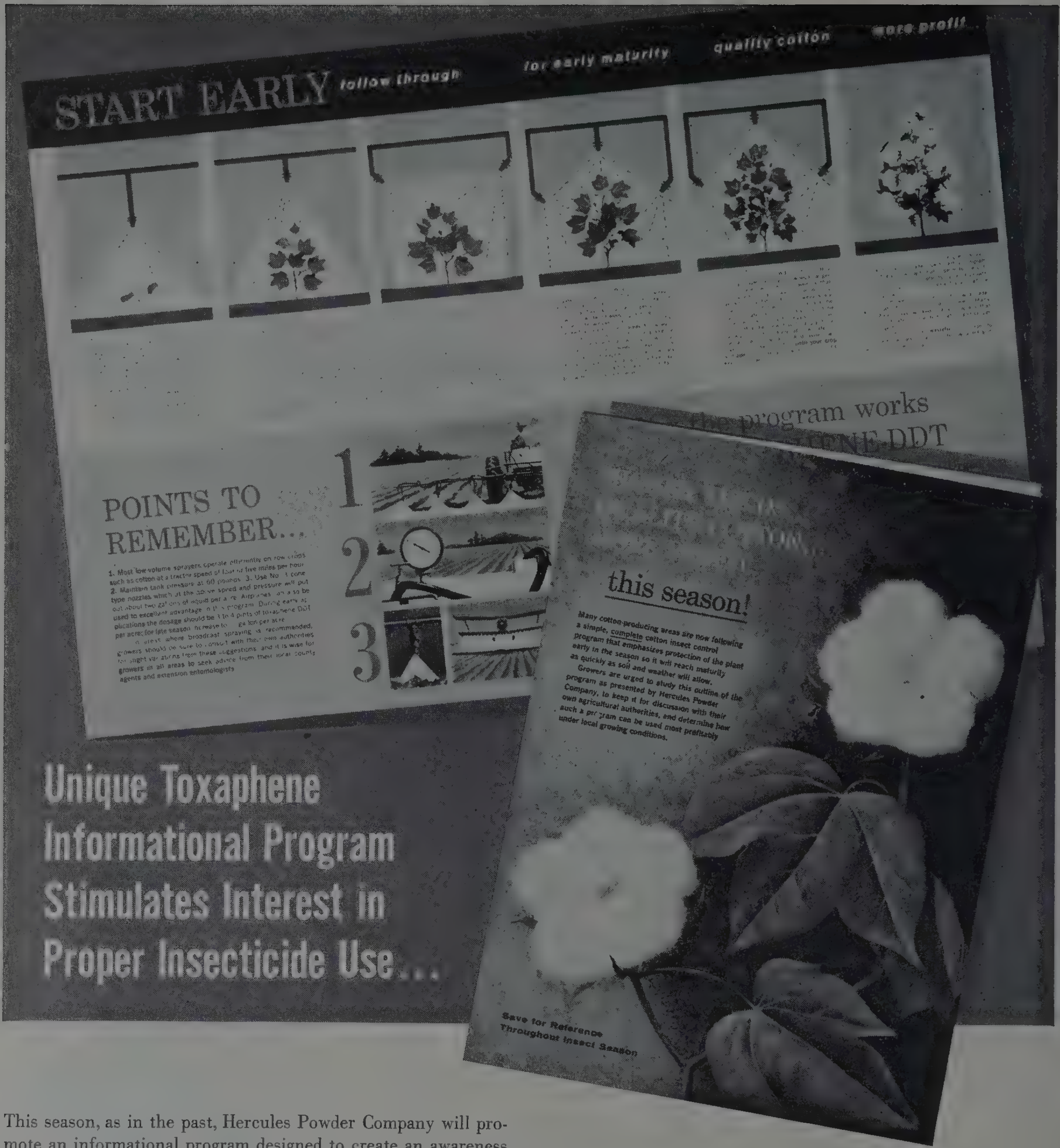
Stauffer Buys Alcoa Unit

Stauffer Chemical Co., New York, has purchased the flourides-producing facilities of the Aluminum Company of America at East St. Louis, Ill.



Many cotton-producing areas are now following a simple, complete cotton insect control program that emphasizes protection of the plant early in the season so it will reach maturity as quickly as soil and weather will allow.

Growers are urged to study this outline of the program as presented by Hercules Powder Company, to keep it for discussion with their own agricultural authorities, and determine how such a program can be used most profitably under local growing conditions.

This season, as in the past, Hercules Powder Company will promote an informational program designed to create an awareness of the need for better insect pest control. One of the highlights of the 1961 program is a four-page, four-color insert running in leading Cotton Belt publications, outlining a planned, complete program of cotton insect control with toxaphene-DDT, the insecticide combination with "synergistic action."

Toxaphene promotion with seasonal messages will also appear in local farm publications, newspapers, and on local radio and TV stations and other media. Hercules will also continue its long-time sponsorship of leading radio and TV farm directors in the Cotton Belt and in other prime toxaphene markets.

Millions of farmers will have a new interest in toxaphene and the toxaphene-DDT combination. The Hercules informational program will help them get the most from their insecticide dollar—build more confidence in insecticides.

A copy of the special Cotton Belt insert "Higher Yields, Quality Cotton, More Profit" is available on request. Write to:

TOXAPHENE

Agricultural Chemicals Division
HERCULES POWDER COMPANY
Hercules Tower, 910 Market Street
Wilmington 99, Delaware

NX61-3

Louis Ware Scholarship Winners For 1960-61

The first recipients of $1,000 senior-year scholarships awarded by International Minerals & Chemical Corporation under a new program at 12 leading colleges are shown at IMC's headquarters in Skokie, Ill. The scholarships — six in minerals sciences and six in agricultural sciences—are named for Louis Ware, IMC board chairman. Left to right, seated: Martin D. Merz, Stanford; Wayne M. Brooks, North Carolina State; William N. Seery, Colorado School of mines; Melvin M. Mathias, Purdue; and Steven W. Clark, Minnesota. Left to right, standing: George A. Ekstrom, Cornell; Joseph C. Conway, Pennsylvania State; Leroy J. Hushak, Iowa State; Terry N. Turner, Missouri School of Mines; Guy R. Honold, Wisconsin; Richard W. White, Michigan College of Mining and Technology; Thomas M. Ware, President of IMC; and Charles D. Kesner, Michigan State College, East Lansing, Mich.

Moshe Novomeysky Dies

Moshe A. Novomeysky, who tapped the potash deposits of the Dead Sea, died recently in Paris. He was 88 years old.

Mr. Novomeysky was head of the Dead Sea Works Ltd., which extracts more than 100,000 tons a year of potash and other minerals from the Dead Sea. Born in Russia, Mr. Novomeysky went to Palestine in 1911 and began surveys and experiments that turned the waters into an asset. With the support of Israel B. Brody of New York, he raised $2,000,000 to start the Palestine Potash Company, with its extraction plant on the shores of the Dead Sea. The plant was destroyed during fighting between Israel and her Arab neighbors during 1948. A new plant has since been built in Israeli territory as the Dead Sea Works Ltd.

•

Warehouse Contract Awarded

California Chemical Co., San Francisco, has awarded contracts for the construction of warehouse facilities at the complex fertilizer plant now under construction for the Ortho Division of California Chemical Co. in Fort Madison, Iowa. The general contractors on the job will be the Priester Construction Co., Davenport, Iowa, and W. A. Klinger of Sioux City.

The complex fertilizer warehouse is to be the largest bulk operating warehouse in the U. S. when finished. It will have a capacity of 70,000 tons of complex fertilizer.

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XVIth International Congress

The XVIth International Horticultural Congress will be held in Brussels, Belgium, from August 31 to September 8, 1962. The congress is being organized under the auspices of the International Society for Horticultural Science.

•

Potash Expansion Continues

Pittsburgh Plate Glass Co. and Armour & Co. have announced plans for a joint venture in solution mining of potash. The new partners last month disclosed plans for a $1 million experimental solution drilling unit in the Canadian potash fields. Drilling of test wells already has started on a property 18 miles east of Moosejaw, Saskatchewan, to tap deposits underlying that area.

In solution mining—an innovation for potash—water is pumped into the mineral deposit, the mineral is dissolved in the water, and then is recovered above ground from the solution. Pittsburgh Plate's chemical division has for a number of years mined sodium chloride at depths as great as 6,800 feet by the solution method.

•

CSMA To Discuss Pesticides

E. F. Mace, S. C. Johnson and Son, Inc., Racine, Wisc., will discuss house and garden aerosols in a symposium on aerosol insecticides to be held by the Insecticide Division of the Chemical Specialties Manufacturers Association at the association's annual meeting in Chicago, May 16 and 17. The meeting will be held in the Drake Hotel.

Also on the program are; John Odeneal, Fairfield Chemicals Division, Food Machinery and Chemical Corp., New York, "Space Formulations — Up to Date", and J. E. Bussart, Velsicol Chemical Corp., Chicago, "Residual Formulations — Up to Date."

Dr. H. L. Haller, Agricultural Research Service, USDA, will present his personal observations on pest control in Russia and other European countries and Dr. George C. Decker, Illinois Natural History Survey, Urbana, will present a paper on problems in the control of face flies.

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Shell Plans Sulfur Plant

A gas processing and sulfur plant will be constructed by Shell Oil Co., New York, in the Bryans Mill gas field in Cass County, Texas. Scheduled to be in operation by the end of this year, the unit will extract hydrogen sulfide from gas and convert it into elemental sulfur.

•

Atlas Plans Name Change

Atlas Powder Co., Wilmington, Del., plans to change its corporate name to Atlas Chemical Industries, Inc., upon completion of its merger with Stuart Co., a Pasadena, Calif., ethical drug maker.

WETTABLE POWDER INSECTICIDES ARE MORE POTENT REMAIN FREE-FLOWING...

when formulated with CELITE *diatomite fillers*

The ability of Celite* diatomaceous silica to absorb its weight in water or oil pays off for insecticide formulators in two ways. (1) Celite absorbs large quantities of liquid poisons while retaining the easy-to-handle properties of a dry dust. (2) Celite's powerful anti-caking action keeps dusts free-flowing and assures uniform poison dispersion in wettable powders prepared by final packagers.

Pound for pound, Celite gives you far greater performance than other inerts since only ten pounds give you a full cubic foot of extender. Celite gives you far greater value since it absorbs up to 50% more poison than other diluents on a dollar-for-dollar basis.

A Celite field engineer will be glad to give you the full story. Call your nearest J-M office or write Johns-Manville, Box 14, New York 16, N.Y. In Canada, Port Credit, Ontario.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products

Johns-Manville CELITE

INDUSTRY'S MOST VERSATILE MINERAL FILLER

JOHNS-MANVILLE JM PRODUCTS

Research Support Urged

Federal support for agricultural research will not be provided in anything like the amount required unless entirely new action is taken, Wm. Rhea Blake, executive vice president of the National Cotton Council, told the National Peanut Council's annual convention April 10 in Washington, D. C.

He urged action to inspire confidence in what agricultural research can do, to concentrate attention on the big and important problems of farmers, to work realistically toward expanded markets, to promote the effectiveness of agricultural research, and to command the respect of congress. Mr. Blake pointed out that a bill aimed at achieving these objectives passed the House last year and has been re-introduced. It is authored by Representative Abernethy of Mississippi.

"We have three big problems in agricultural research," he explained. "The first is that we don't have enough, the second is the threat of a tragic misdirection of research, and the third is our need to be certain that our entire research effort is just as effective as it possibly can be."

■

Fertilizer Short Course

A short course on fertilizer technology will be held at Purdue University, Lafayette, Indiana, Feb. 12 and 13, 1962, under the sponsorship of the Soil Science Society of America. Chairman of the committee arranging for the short course is Dr. Malcolm H. McVickar, Ortho Division, California Chemical Co.

The short course will immediately precede the annual Joint Meeting of Midwestern Agronomists and Fertilizer Industry Representatives at the Edgewater Beach Hotel, Chicago, Feb. 15 and 16.

■

Plan More Pyrethrum

Plans for increasing pyrethrum production in Kenya to 14,000 tons per year were announced recently by Norman Hardy, executive officer of the Kenya Pyrethrum Board and administrator of the African Pyrethrum Technical Information Centre Ltd. He said that more than 20,000 African families and 1,050 European farmers are now producing pyrethrum in Kenya.

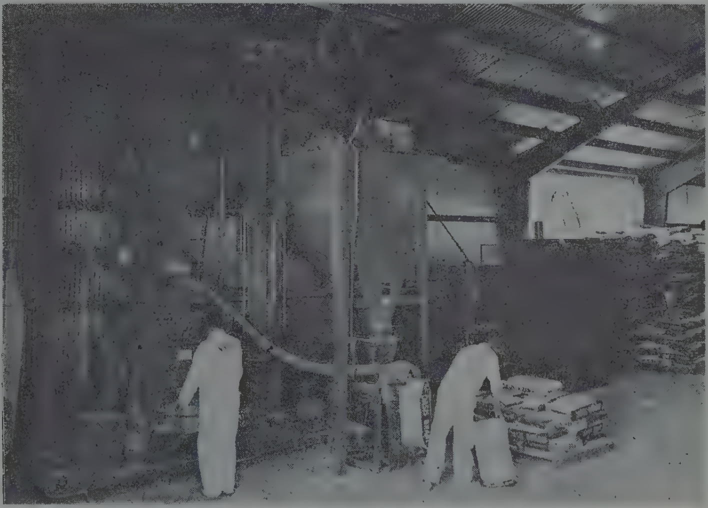
■

WACA Meeting Oct. 9 to 11

The 1961 annual meeting of the Western Agricultural Chemicals Association will be held in the Hotel Claremont, Berekeley, Calif.

R&H Microbial Insecticide

Rohm & Haas Co., Philadelphia, is offering a microbial insecticide tradenamed "Bakthane" for the control of such agricultural pests as the cabbage looper, imported cabbage worms, tobacco hornworm, and tobacco budworm. The active ingredient in Bakthane is *Bacillus thuringiensis* Berliner, in the form of viable spores. Bakthane may be applied as a spray, dust, or bait.



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SOLVES MANY OF YOUR PROBLEMS

In the field of fertilizers and insecticides, the Poulsen Uni-Blender is our standard unit—a plant that's *Ready-To-Run. It mixes, elevates, grinds, and bags. Impregnates liquids with diluent mixes.
If your product deteriorates from long delays in shipping, you want to deliver a fresh product . . . the Uni-Blender can do it!
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This unit can handle four to six,1200 to 1500 lb. batches of field strength dust per hour. Other capacities are available.
Requires only 9' by 12' floor space and 16' headroom. Factory pretested and ready 'to go to work for you just two days after delivery.
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GENTLEMEN: *Please send me your technical bulletin about the standard unit Uni-Blender.*
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To Use Elemental Method

The elemental method of expressing fertilizer nutrients, including minor elements, will be used in the research and educational journals of the Soil Science Society of America and the American Society of Agronomy, beginning with the January 1962 issues.

Contributors to the journals, however, will be permitted to include the oxide expressions such as P_2O_5 and K_2O along with the elemental analyses. The society publications include the research journals *SSSA Proceedings* and *Agronomy Journal* and the magazine *Crops & Soils.*

•

Arizona Co. Advances Two

Ted W. Swift, formerly executive assistant in charge of production for Arizona Fertilizer and Chemical Co., Phoenix, has been named vice president of the company. He joined the firm in 1938. At the same time, the company announced the appointment of Joseph G. Hartsig as assistant vice president. He had been executive assistant in charge of purchasing and product development.

■

Sees More Nitrogen Use

Haven Leavitt, Snell Development Co., Modesto, Calif., projected nitrogen's future in California agriculture at the 9th annual California Fertilizer Conference, held on the Kellogg-Voorhis campus of California State Polytechnic College, Pomona, March 27 and 28. He reported a steady and rapid increase in the use of nitrogen in California between 1940, when 31,820 tons were applied, and 1959, when 260,270 tons of nitrogen were applied.

The development of improved placement of fertilizers, he said, is enhancing the efficiency of nitrogen utilization. Mr. Leavitt predicted an ever-increasing tonnage of nitrogen in California.

Seek Credit To Build

A syndicate formed by eight Japanese manufacturing firms is negotiating with the Japanese government for a credit of 20 to 25 million U. S. dollars to finance the construction of a fertilizer plant for India. The syndicate reportedly has made a bid to build the $50 million fertilizer plant which would be located in Uttar Pradesh State. The plant would have an annual production capacity of 1,400,000 tons of urea.

•

U.S. Borax Names McCloskey

Dr. A. L. McCloskey has been appointed to the newly-created position of associate director of market development and technical service of United States Borax & Chemical Corp., Los Angeles.

He had been associate director of chemical research for U.S. Borax Research Corp. at Anaheim, Calif. In his new post, he is located at the company's New York office.

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THE SUPERIOR
ANTI-CAKING,
CONDITIONING AND
COATING AGENT
FOR HIGH-ANALYSIS,
GRANULAR,
COMPLEX
FERTILIZERS

KENITE 51 made from high-quality diatomite (diatomaceous silica) is highly economical to use. It is up to 400 percent more efficient than other conditioners because of its greater surface area. This means less is needed, leading to a very low cost per ton of fertilizer conditioned.

Write today for complete information on KENITE 51 and learn how it will improve the handling of your fertilizer and result in more satisfied customers.

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CONTROL RUSSIAN KNAPWEED

WITH OLDBURY® SODIUM CHLORATE

When herbicides are used, Oldbury sodium chlorate is still the most effective weed killer you can get for such troublemakers as Russian knapweed, Johnson grass, Canada thistle, and bindweed.

Oldbury sodium chlorate sterilizes the soil . . . reaches right down to the roots of the weed . . . and keeps working for months.

Oldbury sodium chlorate is inexpensive. For a mere 25¢, you can sterilize 100 square feet of drainage ditch, fence line, or roadway for a year or longer.

Open-head drum empties easily. Oldbury sodium chlorate comes in a fast-opening drum. A single lever seals and reseals the drum with a metal band. Full-open head makes pouring, scooping, or shoveling easy.

Available in 50-, 100-, and 450-lb. sizes.

Technical aid. Full-time Hooker agronomists can help with weed control plans and advise on handling, storing, and using sodium chlorate. Write for descriptive folder.

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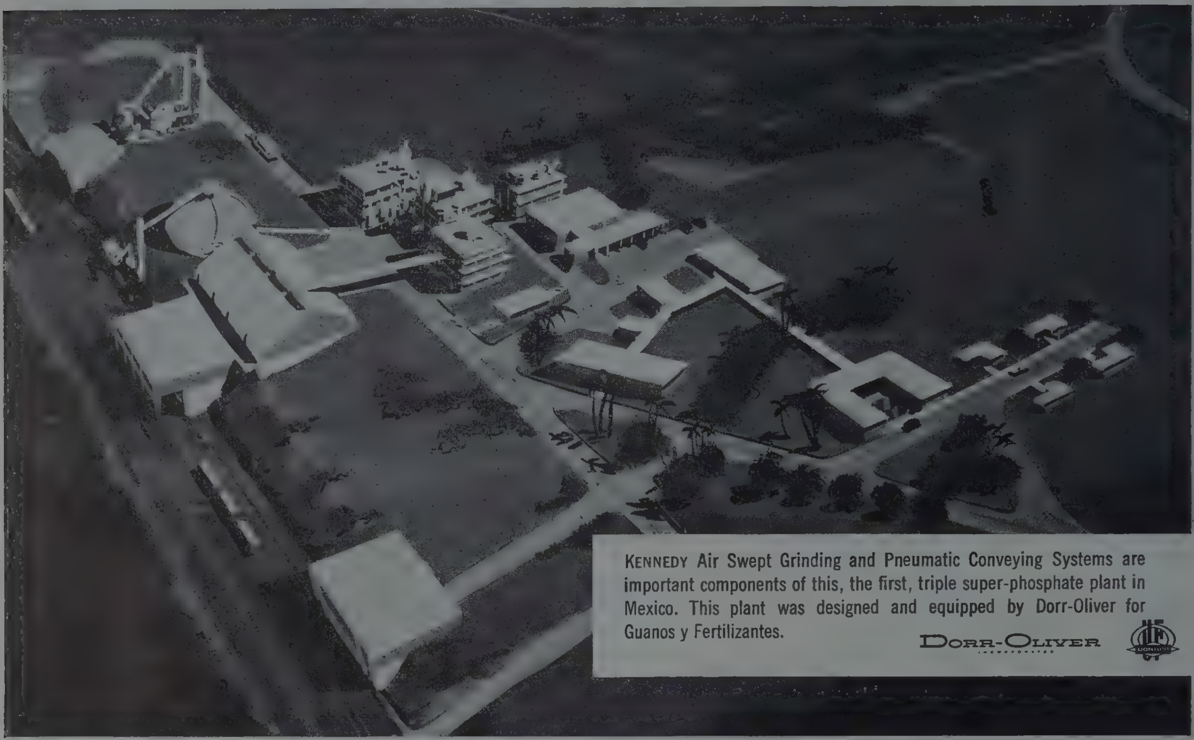
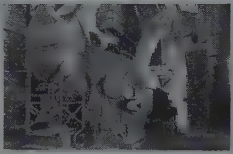
KENNEDY for grinding & conveying phosphates



Kennedy Air Swept Grinding and Pneumatic Conveying Systems are important components of this, the first, triple super-phosphate plant in Mexico. This plant was designed and equipped by Dorr-Oliver for Guanos y Fertilizantes.

Dorr-Oliver



Kennedy Ball Mills are noted for high tonnage and low cost processing of phosphate rock and other agricultural chemicals:

- Lowest maintenance cost—cannot be jammed or damaged by tramp iron or other foreign material
- No periodic shut downs for wearing part replacement
- Grinding media is replaced without interruption
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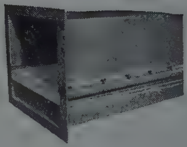
- Careful basic design and pressure lubrication assure high mechanical efficiency
- Reliable feed control and overall reliability provide high production with minimum manpower
- Higher capacity in single units—less space and structural steel per ton of capacity and lower initial investment.



Kennedy AIR-FLOAT Conveyors provide trouble-free air-gravity conveying of dry materials:

- There are no moving parts—nothing to wear—nothing to maintain
- Only small volumes of low pressure air are needed—uses less power
- Operates quietly—has high capacity—requires little headroom
- The conveyed materials are completely enclosed—there is no dust
- Permits flexible design—directional changes are simple
- Can be made from corrosion resistant alloys
- Eliminates lubrication, complicated gears, belts and chains, spare parts and down time for maintenance.

Consult Kennedy for further details. Let us show you the many advantages Kennedy equipment can offer you.

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Primary & Secondary Gyratory Crushers • Jaw Crushers • Roll Crushers • Impact Breakers • Hammer Mills • Rod & Ball Mills • Kilns • Dryers • Screens • Mechanical & Pneumatic Conveyors • Complete Crushing, Lime, Cement & Carbon Paste Plants. Kennedy Research & Testing Service.

Fertilizer Producers See 10% Rise in Sales

FERTILIZER manufacturing officials are reported in a *Wall Street Journal* "News Roundup" to be optimistic about the prospects for sales during the current fertilizer season. According to one official, sales are excellent. During March, sales reportedly were well ahead of last year in every region of the country but the East, where the weather was wet.

Other reasons listed for the increased demand for fertilizer include the rapid expansion in population, the search for better foods and for more production per acre, and the increased income realized by farmers during 1960. Estimates place the 1961 gain in sales as high as 10 per cent over last year's sales of $1,220,000,000. It is believed that the industry will be prevented from going higher than a 10 per cent gain because at that level it will be operating close to full capacity.

On the other side of the picture, however, there are fears that there may not be enough trucks and freight cars available to haul the heavy tonnages expected during the current peak period when almost two-thirds of the close to 27 million tons of fertilizer expected to be sold this year is being shipped. Producers also have expressed concern about imports of foreign-made fertilizer. At ports such as New Orleans, incoming foreign shipments have affected regional prices. On the whole, however, prices are firm. An example is phosphoric acid, currently selling for about $75 per ton.

Rutgers Names Merrill

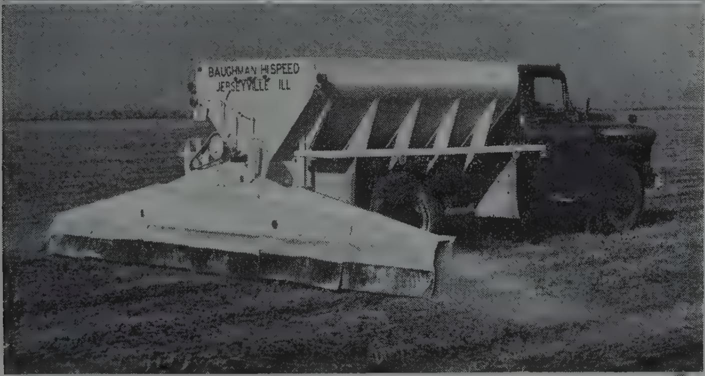
Dr. Leland G. Merrill Jr., Rutgers research specialist in entomology, last month was named dean of the College of Agriculture, Rutgers University, New Brunswick, N.J., and director of the Agricultural Experiment Station of the university. Dr. Merrill succeeds Dr. William H. Martin, emeritus dean of the college of agriculture, who retired last June.

Dr. Merrill's first Rutgers appointment was as a research assistant in entomology in 1946. He received a master's degree from Rutgers in 1948 and his Ph.D. degree the following year. He was an assistant professor of entomology at Michigan State from 1949 to 1953. He rejoined the Rutgers faculty in September, 1953.

D-O Transfers Harrison

Harry Harrison has been transfered from the engineering department of Dorr-Oliver Inc., Stamford, Conn., to the company's pump sales division as application engineer. In this position, he provides technical assistance to the fourteen distributors of Dorr-Oliver pumps in the U.S., and to their customers.

STOP SPOTTY SPREADING!



Make Every Pound Pay with BAUGHMAN'S K-5 LIME and FERTILIZER SPREADER

MOST EFFICIENT SPREADER . . . experience-engineered so that you can accurately regulate the number of pounds spread per acre and be sure of uniform distribution.

LOWER MAINTENANCE COST . . . thanks to the most rugged spreader body ever built. Extended side jacks, internal braces, and reinforced top edge provide full side support and greater protection. Fewer working parts, too.

GREATER VERSATILITY . . . with the chance to select the drive, conveyor, and distributor that best answer your spreading needs.

LUBRICATION-IMPREGNATED CHAIN helps retard corrosion and prevent freezing . . . another Baughman exclusive!

Your choice of . . .
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SERVICE AND PARTS FROM 200 SERVICE BRANCHES.

BAUGHMAN MANUFACTURING CO.
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Critics Termed Uninformed

Herbert Woodbury, president of Midwest Agricultural Chemicals Association, termed as "uninformed" the various groups who decry the use of agricultural chemicals. Speaking before a recent meeting of the Nebraska Grain and Feed Dealers Association at Omaha, he identified these groups as "organic farmers wild life supporters, and Audubon organizations."

"Obviously," Mr. Woodbury said, "if all efforts to control pests were abandoned in this country, agricultural lands soon would revert to the conditions that prevailed prior to the coming of the white man, capable of supporting only about one million persons. What would happen to the rest of us?"

•

To Build Ammonia Plant

W. R. Grace & Co., New York, plans to build an ammonia plant in Big Springs, Texas. The plant is expected to be producing early next year and is designed to produce in excess of 60,000 tons of ammonia annually. Foster Wheeler Corp., New York, will design and construct the plant.

The new plant will adjoin the Big Spring oil refinery of Cosden Petroleum Corp. and will be operated for Grace by Cosden. Grace owns 53 per cent of the outstanding stock of Cosden.

•

Correction

Our report of the W.A.C.A. spring meeting, starting on page 16 of the April issue, quoted P. J. Reno of Hercules Powder Co. as saying that only 75 pounds of cotton linters per acre are produced in Egypt. What Mr. Reno actually said is that only 75 pounds of lint cotton per acre are produced in *India,* compared with more than 400 pounds in the U. S.

Actually, Egypt will average higher per acre yields than the U. S. when growing cotton of comparable variety.

Niagara Opens New Plant

A pesticide formulating plant at Dothan, Alabama has been established by Niagara Chemical Division of Food Machinery & Chemical Corp., Middleport, N. Y. The new unit will produce insecticide and fungicide formulations.

James M. Swilly, formerly a foreman at Niagara's Jacksonville, Fla., plant, is production manager at the new plant, which is located in an existing 16,000 square foot building on Alabama Highway 53.

•

Beddoe Joins Great Western

Paul Beddoe has joined the agricultural chemical department of Great Western Chemical Co., Portland, Oregon. He is located in Medford, Oregon, where Great Western has a warehouse and office for distribution of agricultural chemicals in the southern Oregon and northern California area.

Mr. Beddoe formerly was with Bear Creek Orchards in Medford, Oregon.

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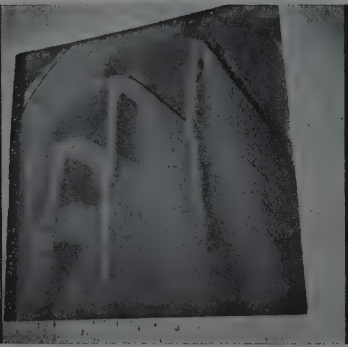
DRYERS · COOLERS · AMMONIATORS

8′ x 60′ oil heater rotary dryer removes excess moisture, completes granulation.


McDermott-designed lifters with cup design, staggered for even distribution of granules.

This is one of 17 Rotary Dryers and Coolers, planned, designed and built for the American Agricultural Chemical Company. This dryer installation is at their Saginaw plant.

Write for free brochure on McDermott Equipment, or for estimates.

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COMPATIBLE
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PYRAX® ABB

PYRAX ABB is the best known and most widely used agricultural diluent. It offers maximum compatibility with most toxicants.

It has been used with rotenone since agricultural dusting was in its infancy. It is now used equally well with the newest organic toxicants.

PYRAX ABB is pyrophyllite. It is chemically inert, has low moisture content and neutral pH. Little or no stabilizer is needed. When you dilute your toxicants with PYRAX ABB, you achieve easier handling, better coverage and simpler formulation.

You can order PYRAX ABB and PYRAX Granules for shipment in mixed carloads or truckloads.

Write for Compatibility Data Today

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Please send Bulletin 19D "Compatibility of Vanderbilt Diluents with Agricultural Toxicants"

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(Please attach coupon to your Company letterhead) P-20

Increased Fertilizer Exports Predicted For 1961

PROSPECTS for an increase in U. S. exports of fertilizers in 1961 are favorable, according to the Business and Defense Services Administration of the U. S. Department of Commerce. Because of the adverse international balance of payments situation, the International Cooperation Administration has been directed to restrict purchases of commodities abroad with its fund, a development that may result in more fertilizers being procured in the United States for aid programs in Korea and other countries. Formerly, foreign suppliers have underbid the U. S. industry for much of the ICA fertilizer business.

World supplies of potash, which became tight during the last half of 1960, may lag behind demand in 1961. A slowdown strike in French mines, although now settled, curtailed exports from that country, and in Spain a mechanical breakdown has reduced potash supplies. Consequently, the U. S. potash industry may be faced in 1961 with a combined domestic and foreign demand for potash that will exceed supplies. Difficulties encountered by potential Canadian producers in sinking mine shafts have delayed the availability of potash from that source. However, production in Saskatchewan is expected to be underway by late 1961 or early 1962.

The immediate outlook for world nitrogen is for increased capacity and sharper competition. World production and consumption of fertilizer nitrogen during the 1958-59 fertilizer year are estimated by the Food and Agriculture Organization of the United Nations at 8,750,000 and 8,000,000 metric tons N, respectively. Although nitrogen sales in the Common Market area were up in 1959-60, European sources indicate that there was considerable price cutting and loss in earnings by producers. Relief from the surplus does not appear imminent inasmuch as capacity is projected through 1965 at an annual rate of increase of 880,000 tons N, and consumption growth at 800,000 tons.

In the United States, total 1960 production of nitrogen (synthetic and byproduct for fertilizer and industry) of approximately 4,200,000 tons N is estimated to have exceeded 90 per cent of capacity. In recent months, however, plans have been announced for 7 new synthetic ammonia plants. These new projects will total approximately 500,000 tons N, bringing overall nitrogen capacity to 5,000,000 tons or more by the end of 1962.

●

NFSA To Meet Oct. 31

The National Fertilizer Solutions Association will hold its annual convention at the Edgewater Beach Hotel, Chicago, October 31 to November 2.

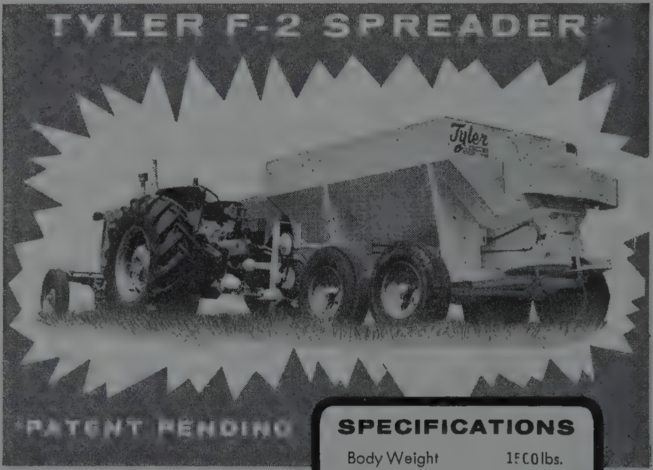
Tyler Leads the Way!

a sensational BREAK-THROUGH in design and engineering!

DO-IT-YOURSELF

fertilizing equipment which you can rent to your customers . . . spreads up to an acre per minute.

- **Hauls and spreads fertilizer quickly and efficiently**
- **45 foot spread pattern**
- **Investment in this machine will move up to 600% more fertilizer**



distributor and dealer inquiries invited!

Also a complete line of track bulk spreaders

SPECIFICATIONS

Body Weight	1500 lbs.
Hopper Dimensions	60" x 84"
Wheel Track	74 inches
Axle Rating	4000# each axle
Type Axle	Tandem Torsion Spring
Fans	Angled Twin 19 in. Dia.
Wheel Bearing	Sealed Timkin Bearing
Capacity	2½ Ton
With Body Extension-19 in.	4 Ton
Spread Pattern	Approx. 45 Ft.
Spread Capacity Pr. Hr.	30-60 Acres
Field Speeds	
6 M.P.H.	30 Acres Pr. Hr.
12 M.P.H.	60 Acres Pr. Hr.
18 M.P.H.	90 Acres Pr. Hr.
Highway Speeds	up to 60 M.P.H.

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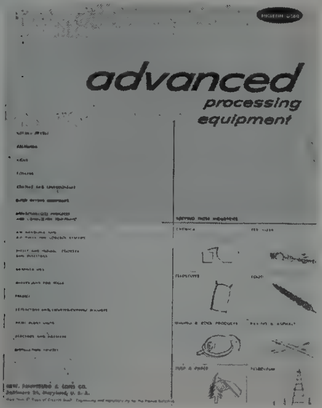

advanced
processing
equipment

Edw. Renneburg & Sons Co., Baltimore, Md., is offering a bulletin that describes its processing equipment. Among the units described and illustrated in the bulletin are ammoniating and granulating units, conveyors, coolers, dryers, mixers, and pug mills.

Also described in the bulletin is Renneburg's pilot plant research and development center where the most effective processing methods are determined for various products. The bulletin, G560 AC, is available from the company.

●

Automatic Weighing System

A gross weighing bagger for free-flowing materials that tend to aerate is being offered by the Thayer Scale Corp., Pembroke, Mass. The bagger, G18R, fills 100-pound bags at rates up to three bags per minute.

●

Raymond Offers Catalog

The Raymond Division of Combustion Engineering, Inc., Chicago, is offering a 16-page, two-color bulletin on mechanical air separators. Described in the bulletin are the features of single and double mechanical air separators, plus detailed diagrams of the equipment available and pertinent technical data. The bulletin, Number Ninety, is available from the company at 427 West Randolph St., Chicago 6.

●

Range Fertilization Movie

The story of rangeland fertilization, much of it seen through the eyes of an aerial applicator, is told in a recent Ortho Agricultural Newsreel release. The movie outlines the important steps in a rangeland fertilizer program—good management practices, the use of marginal land, and the utilization of the extra feed that fertilization provides.

The film was produced for the California Chemical Co., Richmond, Calif., by Ingraham Productions, San Francisco. It is available on free loan for showing to interested groups from L. F. Czufin, manager of advertising and public relations for California Chemical Co.

●

Zonolite Conditioner

A new anti-caking product for mixed fertilizers is being offered by Zonolite Co., Chicago. Called "Conditioner BO5," the product is incombustible and is shipped in either bulk or bags.

●

Chemagro Guthion Brochure

A brochure illustrating fruit insects that can be controlled with Guthion insecticide has been prepared by Chemagro Corp., Kansas City, Mo.

Raven Fiberglass Tanks

Raven Industries, Inc., Sioux Falls, South Dakota, has prepared a brochure to describe its fiberglass tanks for crop spraying. Among the features listed for the tanks, which are available in 110 and 200 gallon capacities, are corrosion and contamination resistance, high strength, easy repair, and light weight.

●

Automatic Bag Printer

Bemis Bro. Bag Co., St. Louis, is offering an automatic bag printer that provides clear, uniform printing of product specifications or codes above the sewing line of sewn multiwall paper bags. The Bemis Bag Top Printer is mounted on a sewing pedestal and imprints the bag as it is being sewn closed. The printing speed is set by a variable speed sheave on the motor which is synchronized with the speed of the conveyor and sewing head.

Engineering specifications and operational data are available from the company's packaging service, 305-27th Ave., N.E., Minneapolis 18, Minn.

●

Insect Wall Chart

Velsicol Chemical Corp., Chicago, is offering to dealers handling lawn and garden chemicals a giant-size wall chart that illustrates and describes more than 100 insects.

LISTENING POST

(From Page 66)

---

around the tree, and permitted the use of large amounts of water when necessary.

Cladosporium Spot

D. L. Strider (2), of North Carolina State College, writes that the acreage planted to southern pea (*Vigna sinensis*) in the mountain area of North Carolina has been reduced in recent years because of frequent severe losses resulting from attocks of Cladosporium spot, caused by the fungus *Cladosporium vignae*. Strider investigated varietal resistance and use of fungicides as means of controlling the disease. In the fungicide experiments, he applied sprays of zinc ethylene bisdithiocarbamate (zineb), manganese ethylene bisdithiocarbamate (maneb), basic copper sulfate (Tri-Basic), and 2, 4-dichloro-6-(*o*-chloroanilino)-*s*-triazine (Dyrene). Maneb was superior to the other fungicides tested, but none gave adequate control. Strider concluded that a spray program for control of Cladosporium spot would not be economically practical and suggested that resistant varieties be planted where the disease is a problem.★★

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(1) Converse, R. H. 1960. Control of Phytophthora fragariae with soil fungicides. *Plant Disease Reporter* 44: 948-951. December.

(2) Strider, D. L. 1960. Control of Cladosporium spot of southern pea. *Plant Disease Reporter* 44: 955. December.

(3) Van Gundy, S. D., F. J. Foote, R. L. Rackham, and A. Rinkov. 1960. Studies on methods of application of emulsifiable DBCP around living citrus trees. *Plant Disease Reporter* 44: 830-833. November.

PEST ROUNDUP

(From Page 63)

in some central Arizona fields. In California, medium infestations of the insect were reported from alfalfa in San Luis Obispo County and heavy infestations from the Temecula area of Riverside County.

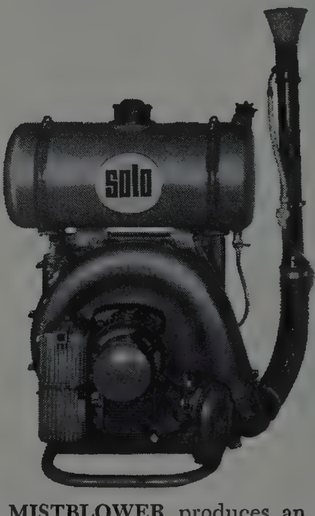
Boll Weevil Survival Survey

THE spring survey to determine the number of boll weevils surviving the winter was completed during March in most of the reporting areas. Woods trash samples were collected in Falls, Hill, Limestone and McLennan Counties, Texas. The average number of surviving weevils per acre of woods trash for the area was 1,516. This compares with a 1960 spring survival count of 2,065.

In Arkansas, collections were made in 7 counties along the Arkansas River in the western part of the state. Surviving weevils were found at the rate of 329 per acre of trash.

Collection of woods trash was made in the northeastern Louisiana Parishes of East Carroll, Madison and Tensas. The average boll weevil survival rate of the three-parish area was 2,193 per acre compared with 4,748 found in the 1960 spring survey. During the 1960 fall survey it was found that 11,487 weevils per acre of trash had entered hibernation. In Mississippi, the survey was conducted in the same four areas surveyed during the 1960 fall hibernation study. The survival counts for the state averaged 1,247 per acre of trash compared with a survival count of 821 in the spring of 1960 and 464 in the spring of 1959. The average number of live weevils in hibernation in the fall of 1960 was 14,502

NOW ONE MAN CAN DO THE WORK OF A TRUCK WITH THE NEW MISTBLOWER "SOLO"



One man with the easily portable MISTBLOWER "SOLO" replaces a pump truck, hoses—can easily get into areas with poor access roads and over rugged and rocky terrain.

A beautifully engineered power-driven knapsack sprayer does a better job with one gallon of liquid than ten gallons from a hydraulic sprayer.

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per acre. In Tennessee, the boll weevil survival survey was conducted in McNairy County. A survival rate of 1,815 weevils per acre of trash was found. This is the highest carryover in the state since 1953, when the count was 2,200. In the spring of 1959 surviving weevils were 807 per acre.

Collection of surface woods trash to determine weevil survival in North and South Carolina was made in the same areas as those for the 1960 fall hibernation counts. In south central South Carolina the number of surviving weevils this spring was 376 per acre of trash, which is below the 861 found in the spring of 1960. Live weevils found in hibernation last fall were 3,308 per acre. Survival counts in the Coastal Plain area of North and South Carolina averaged 1,129 this spring compared with 1,049 in the spring of 1960. The fall hibernation count in this area was 13,148. The Piedmont section of North and South Carolina had a survival count of 1,558 weevils per acre of trash compared with the 1960 spring average of 590. Live weevils found in hibernation in the area last fall were 8,954. Four hundred thirty surviving weevils per acre of trash were found this spring in the north central North Carolina area. Last spring 377 live weevils were found and in the fall of 1960, 2,582 per acre wer ein hibernation.★★

FERTILIZER VIEWS

(From Page 49)

ford to neglect planning for it. The expected increase in population even within 25 years presents formidable problems when it is considered that the benefits of fundamental research require from 10 to 20 years to be realized and applied generally. The arguments of those who would suspend research in farm production because of current surpluses in grain seem so unrealistic. What we need is sustained, continuing research that will enable farmers to lower crop unit costs of production and improve the quality and the marketing of their products. Private and government research projects directed to these goals will enable our agriculture to satisfy the ever-growing needs of our vigorous, expanding population. Agriculture is our biggest single industry. The dollar value of agricultural production at retail is estimated at over $90 billion per year, or about 20% of our gross national product. Yet the total national investment in agricultural research—private and government — in the past year amounted to about $500 million, only about 5% of the total research and development expenditures for all purposes and from all sources. Too much research in agriculture? Nay! Not enough of it for our national good.★★

WEED CONTROL

(From Page 34)

to show and, because the application of herbicide is so close to the time these discoloration symptoms appear, many farmers blame the weed killer. It is not, of course, impossible to have damage to crops from herbicide use because, aside from mistakes or carelessness, some soils have to be treated much more carefully than others. We had one field in which very definite discolorations appeared during two different years following Monuron applications. In one of these years, we lost some plants in the cotyledon stage from the residual effect of the material. Last year, we used Diuron on this field and suffered no effects on the cotton at all.

In 1958, we operated our own spraying rig and last year our weeding bill was $10.00 per acre, including the cost of the material, and our own cost of application. This is quite a difference from the $34.20 per acre it cost to weed by hoeing in 1955.

Herbicide materials, of course, are not to be taken lightly and applied carelessly. I still worry quite a bit after applying herbicides, but I don't worry half as much as I

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did when we had 50 to 100 men in the fields trying unsuccessfully to hoe out the morning glories. I would not want to farm without herbicides now.

There is no particular secret to doing a good job with herbicide materials. We do not have an expensive spraying rig. Our existing sprayer was equipped with a good mechanical adjustor so, by purchasing a high trailer and booms, screens, and nozzles, we were able to make a spray rig with an investment of less than $600. The most important thing for us to remember is to use herbicide materials according to the book. We have tried to take short cuts and save money twice and it has ended up costing us more each time. We have tried irrigating every other row, hoping the rain would wet the other row enough to get results. Well, it didn't rain last summer and the field I tried this on cost me almost as much as the profit I was making on the other fields on which I followed recommendations and irrigated every row.

Up to lay-by time, we use the old conventional methods of cultivating and hoeing. We have been using the spring or rod weeders as soon as the cotton is large enough to withstand the pressure, and they have helped tremendously to keep the morning glories down before lay-by. In an attempt to take another short cut, I applied herbicides on a field that was not clean of weeds before the application. I had seen large morning glories turn yellow and die other years, so I thought I would take a chance and save a hoeing. Most of the large morning glories turned yellow, but later in the summer they seemed to recover. It cost me quite a bit more later to weed these big vines so that they would not smother my plants completely.

Another mistake I have made is not covering enough space outside my outside row in the skip-row fields. We did a better job last year by using a wider angle nozzle, but there is room for improvement.

Following recommendations in our weed control program has helped to maintain the net income of our farm at a favorable level. Much of the credit for the success of our operation, therefore, must go to the research people who are responsible for the recommendations.★★

STABILIZATION

(From Page 43)

activator before it is combined with the methyl parathion. It is important that the diluent have a pKa greater than 3.3. If it does not, it, too, should be deactivated with a neutral deactivator before it is combined with the methyl parathion.

Under many circumstances, HMT is a satisfactory deactivator for surface active carriers used with endrin. However, when endrin is to be combined with methyl parathion, the possibility of alkaline hydrolysis can be avoided by the use of a neutral type deactivator

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such as a poly-glycol. If physical properties such as the bulk density and flowability of diluents such as talc and calcium carbonate are acceptable, it is preferable that these materials be used in cut-back formulations, because of their lower cost and little or no requirement for deactivation.

In the development of processes for the manufacture of dry formulations, practical consideration must be given to the order of addition of the formulation ingredients. Because some toxicants are decomposed very rapidly when in contact with catalytically active diluents or carriers, they must be deactivated before the toxicant is added and tested with the appropriate indicator for completeness and uniformity of deactivation. Some carriers are deactivated slowly and may require up to an hour or more before the indicator test shows it to be safe. Grinding the carrier with the deactivator before adding the toxicant can frequently decrease the time necessary for deactivation to be completed.

It is hoped that further research on the mechanisms of toxicant decomposition initiated by mineral carriers will result in further improvements in deactivator systems.★★

Literature Cited

Mr. Ordas points out that his paper is a *review* of the published work on dry pesticide formulation and the references cited are the only authorities for the data which have been included.

1. Haller, H. L., Fleck, E. E., *J.A.C.S. 66,* 2095 (1944)
2. from Haller and Fleck, *Ind. & Eng. Chem. 37,* 403 (1945)
3. Deactivated to pKa 3.3. Deactivator H is a product supplied by Velsicol Chemical Corp.
4. Malina, M. A. et. al. *J. Agr. Food Chem, 4,* 1038 (1956)
5. Hammett, L. P., Deyrup, A. J., *JACS 54,* 2721 (1932)
6. Malina, loc cit.
7. Malina, loc cit.

SAFETY FACTORS

(From Page 55)

4. He should not take things for granted and should not neglect his pre-take-off drill. The extra money from the extra sortie squeezed out of the time saved will not buy him another neck.

5. A pilot should not fly with his wheels in the crop. It is not really necessary, and there are enough calculated risks to cope with without adding silly ones.

Operator

1. An operator should purchase good equipment. It is difficult for his pilots to make money for him with old and worn-out tools.

2. Good engineers and servicing methods should be employed—it will pay off handsomely in the long run.

3. Operators should not ask pilots to take unreasonable risks; calculated risks, to which the pilots agree, of course, but it should be remembered that a few dollars of extra profit will not bring a dead pilot back to life.

5. Operators should give some thought to the creation of a team atmosphere and spirit in their organizations. It will make them richer in the end.

There is no black magic about agricultural aviation, but success will accompany the team in which the members are able to take a broad and sympathetic outlook on the problems of other members of the team.★★

HOME GARDENS

(From Page 27)

very helpful to retail dealers in this regard.

Among selling aids that the manufacturers and distributors can offer to retail dealers are the sponsoring of such events as open houses, garden clinics, and grand openings. In addition, distributors often can assist in the arrangement of displays.

A system of "planned orders" being used by many regional distributors of garden supplies involves the distributor's taking complete charge of the dealer's garden department. The distributor sells its line of garden chemicals and equipment to the dealer and then follows through with display work, clerk training sessions, inventory maintenance, and replacement of stock. In the case of the Richmond Power Equipment Company, this method has been successful and has made the planned order a thing of great importance to them. Their salesmen do not have to write an order, mower by mower, tool by tool, and chemical by chemical. They simply present a planned order covering all the products. Samples are carried and demonstrated by the salesmen during the season to help get larger re-orders, but records are maintained on each dealer so that, in future seasons, the salesmen can present to the dealer the figures showing what he actually sold during the previous season.

It has been estimated that 1,750,000 new homes will be built each year during the decade of the '60's, and 2,250,000 per year during the decade of the '70's. With this prediction as a basis for optimistic appraisals of future small-package markets, there is solid foundation to the growing belief that sales to home gardeners need no longer be treated as a sideline.★★

ACS MEETING

(From Page 21)

appear. A study of geographic patterns of plant location would indicate that while plants tended to be heavily concentrated in a few locations in 1940, they are currently spread throughout the country.

Further evidence of growth of competition in the industry is offered by the price history for the important nitrogen products during the post-war period. For example, during the period 1953-1960, the price of anhydrous ammonia changed seven times. It might also be noted that despite the major inflationary trend in the economy during the post-war period, the price level for nitrogen increased at a far slower rate than that for the economy as a whole. From 1940 to 1960 the ammonia price level rose only about 40% as compared with an approximate 50% rise in the Bureau of Labor Statistics' Wholesale Price Index.

Because few firms are highly specialized in nitrogen products, it is difficult to determine from corporate statements anything about nitrogen profits for recent years. A reasonable guess, observed Mr. Abrahams, based on certain firms, is that profits in nitrogen have been generally favorable.

It should be noted that the growth of competition in the industry has taken place in the face of contrary predictions by almost all observers. For example, two well known economists, George Stocking and Myron Watkins, felt quite certain in 1946 that the cartel conditions of the 1930's would return as soon as the post-war buyer's market in nitrogen terminated. The FTC was still voicing these fears as late as 1950. Surprisingly, even the very conservative American Farm Bureau Federation was pressuring for a national fertilizer program in the early post-war period, due partially to fears of this type.

The following is a listing of some possible reasons for growth of competition in the industry that have been suggested by different observers:

1. The antimonopoly program and other actions of the U.S. government.
2. The high level of demand for nitrogen in the post-war period.
3. The breakup of I. G. Farben.
4. The TVA fertilizer program.
5. Desire for diversification by producers.
6. Integration opportunities for producers.
7. Technological developments in the industry.

Mr. Abrahams indicated that the nitrogen industry case serves to illustrate an interesting example of the decline of monopoly and the growth of competition resulting from largely natural economic events. "While the government's role has certainly had some effect, it would clearly seem that technological factors have been paramount."★★

AMMONIATOR TECHNOLOGY

(From Page 47)

ner similar to an ammoniator, he will notice that the main body of the bed travels upward in a broad band next to the shell, and spills downward in a narrow band at a much higher speed. Between the two layers moving in opposite directions is a core or "eye" that rotates more slowly than either layer, as illustrated in Figure 5. The size and position of this eye varies with the depth of the bed, the speed of rotation of the cylinder, and the plasticity of the bed. The eye becomes larger at slower speeds, with deeper beds, and with increased plasticity of the bed.

The slow rotational speed of the eye tends to overagglomerate particles, resulting in the formation of large pellets within the eye. The more pronounced the eye, the greater will be the range in particle size of the discharge from the rotating cylinder. The simplest way to decrease the size of the eye is to decrease the depth of the bed.

However, a shallow bed in the average granulating drum does not roll, but slides back and forth. The lack of a rolling bed minimizes agglomeration and results in poor granulation.

The intermediate dams discussed in the preceding section are especially advantageous in a granulating drum. As long as the dams are spaced a distance equal to four times the height of a dam, a rolling bed of any depth will exist along a cylinder of any desired length.

For example, in a granulating cylinder six feet in diameter, a set of intermediate dams six inches high on two foot centers will provide the intensive rolling action in conjunction with a small eye so that the range of particle sizes is decreased, while the length of the cylinder can be chosen to be that necessary to firm the particles at the desired rate of production.

Many plants use the feed end of a drier containing no flights as a granulator. It has been found that the insertion of intermediate dams in the smooth walled section of a drier is a definite aid toward granulation.

An interesting article in a British publication (4) indicates that probably most of us have been running our ammoniators at too low a speed of rotation. The author suggests that a granulating drum should be rotated at one-half the critical speed to yield a product with the least variation in particle size.

Critical speed is defined as $76.5/\sqrt{D}$ where D is the drum diameter in feet.

Mr. Hignett of TVA stated at the 1960 Round Table that TVA's data indicated one-third critical speed as best when spargers are located underneath a bed of solid phosphates; while one-half the critical speed was best when spargers are located above the bed.

As more people study rotary ammoniators and granulators, more data will be obtained that will narrow the present range of variables that affect operation. It is believed that the use of intermediate dams is a step in this direction.

To Be Continued

PESTICIDE OUTLOOK

(From Page 19)

farm more acres. Pesticides are being sold to smart managers, who follow good practices, such as investing in proper equipment and using plenty of chemicals. The farmer market is getting smaller, but more farmers are seeing the value of the pesticide industry's products. In many areas, alert farmers are seriously examing their traditional purchasing methods. Some are purchasing technical grades of pesticides, bypassing distributors and commercial formulators, and are doing their own formulating.

The upshot of it all is that the Department of Agriculture now predicts a 20 per cent rise in pesticide use by the mid-1960's. In the background is the vision of new things to come—new chemicals to control pests more efficiently and more versatile chemicals to replace those with limited use. The cost of development of a single chemical—now over one million dollars—can be recovered by stressing versatility.

During the past 20 years, the pesticide business has grown seven times. During the next 20 years, the business will increase tenfold. This is because agriculture has increased its productive capacity many times by using pesticides. Only by further increasing its use of pesticides will it increase productive capacity to meet the demands and needs of consumers in an expanding population. Estimates of crop losses from uncontrolled pests total 9 billion dollars annually. A sales volume of only 290 million dollars of pesticides hardly scratches the surface of the need that exists.★★

GRANULAR PESTICIDES

(From Page 33)

be loaded with fines and bear little relationship to the original carrier in mesh analysis. If the mesh range is indicated on the package of a finished pesticides, as has been proposed, the mesh determination should be made on the finished formulation and not assumed to be identical with that of the original carrier.

The degree and rate of mechanical breakdown of the granules in water or moist soil differ greatly between the RVM and LVM types. The RVM granules disintegrate or turn to mud fairly readily, while LVM granules are resistant to this disintegration. There is a test method to determine degree of water breakdown described in the Federal specifications covering granular insecticides for fire ant control. Degree of water breakdown of the granular product is influenced not only by the carrier but by the pesticide chemical, the solvent, and other additives. It is assumed that the release and distribution of the toxicant itself after application in the field are directly related to water breakdown characteristics, but this is not a clear picture and probably varies greatly with different pesticides. It is obvious that environmental conditions during and subsequent to application, such as soil moisture and rainfall, exert an influence on release and distribution of the toxicant and, therefore, possibly on the degree of success of the control program.

Certainly, volatility and solubility in water of the toxicant and its concentration on the granules would be expected to influence its release from the carrier and its distribution in soil or water. The nature and amount of organic solvent present in the formulation and many other factors affect toxicant release. A study[2] of release of organic phosphate ester insecticides from absorptive carriers in columns of water has indicated that rate of toxicant release bears a direct relationship to volatility and concentration of solvent, but an inverse relationship to particle size. Magnitude of surface energies inherent in adsorption also might play a great part in toxicant release, and these adsorptive forces would be expected to vary specically with different toxicant chemicals.

Sorptive carriers, such as attapulgite, are somewhat hygroscopic in nature, and the question concerning possible adverse effects of free moisture on sorptive capacity naturally comes to mind. Actual

---

[2] Criteria for Selecting Granular Insecticides for Vector Control, Mir S. Mulla, University of California Citrus Experiment Station, Riverside, California, 1960.

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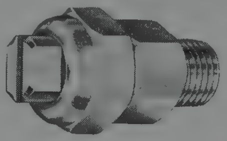

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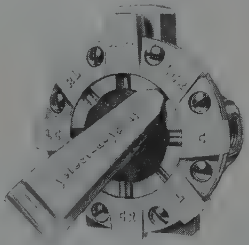

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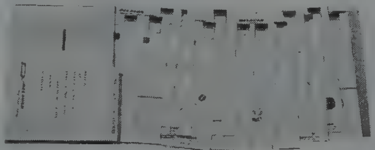

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test results with attapulgite indicate very little adverse effect, calculated to sorptive capacity on the bone-dry clay basis, up to about 5% free moisture content. Up to that limit, an increase in free moisture of 1% would mean 1% less actual bone dry clay per unit weight of the carrier and a reduction in sorptive capacity of about 1%. If the practical sorptive capacity (total of adsorption and absorption) of a carrier for a pesticide composition is 30%, then a 1% increase in free moisture might be expected to decrease this sorptive capacity by 0.3% to a resultant 29.7%. Above the 5% level, additional free moisture seems to exert an adverse effect about one and one-half times the effect up to the 5% level. If a fresh attapulgite carrier is impregnated with a pesticide composition and sorptive capacity is fairly well satisfied, hygroscopicity no longer is a very important factor.

It is doubtful that the actual requirements for most effective pest control in the field are known in most cases. Release and distribution characteristics of different pesticide chemicals vary greatly, and even the basic manufacturer of the chemical may not have a clear understanding of this. Certainly, the toxicant distribution requisites would be expected to differ in the cases of controlling an active subterranean insect which moves about in the soil, and of killing a germinating weed seed which is fixed in position. Too often, an experimental formulation with a certain size and type carrier was arbitrarily made up and later became the basis for a restrictive standard. More should be known concerning these biological criteria, actual chemical and physical requirements for optimum biological control, before unreasonable specifications are imposed on the carrier manufacturer and pesticide formulator.

Perhaps this article has raised many questions and provided too few answers. It is hoped that some of the problems have been defined and some clues to answers provided. Most of all, it is hoped that the existence of many technical facets to the problem has been demonstrated and the need for cooperative consideration by all the various groups involved has been proved.★★

LIQUID FERTILIZER

(From Page 24)

program over Crookston's radio station, KROX. The program involves farm news, local chatter, and information on liquid fertilizers. Mr. Cochrane, by the way, acts as both announcer and programmer for the 15-minute show.

With an eye on the future, Crookston recently added a fourth meter to the Autobatch panel. The new meter, to be used for adding nitrogen solutions, is regarded as an increasingly important component as liquid fertilizer formulation becomes more complex. The company also is considering the installation of automatic routing controls, now standard on the B&L but not available when their plant was installed.

The Minnesota firm has more storage tanks than many liquid manufacturers because Crookston is "a long way up". For example, acid comes all the way from Lawrence, Kansas. Acid storage includes one huge 80,000 gallon tank and two smaller units. Total tank capacity for raw materials at Crookston is 260,000 gallons. There are a number of tanks for finished product storage — totalling about 160,000 gallons. Dealers account for another 300,000 gallons of finished product storage.★★

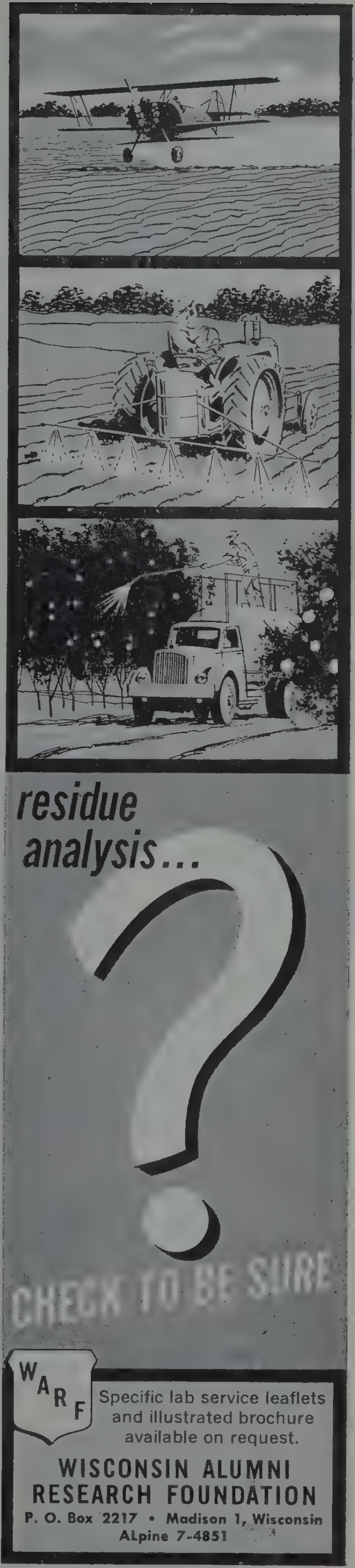
11-33-0 PRODUCTION

(From Page 18)

as the result of hydrolysis salting out will occur at a higher temperature.

Storage Properties

Liquids that contained 50 per cent or more of the total phosphate as polyphosphates have stored satisfactorily for more than a year at



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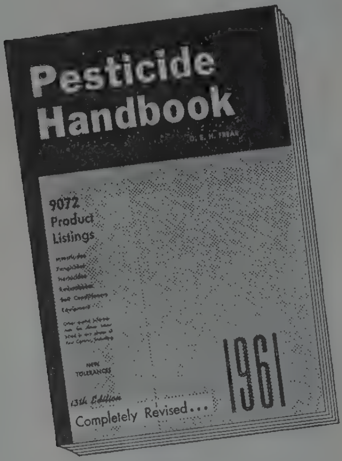

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about the editor —

Dr. Donald E. H. Frear, Editor of PESTICIDE HANDBOOK 1961, is one of the leading authorities on the chemistry of pesticides. He is the author of "Chemistry of Insecticides and Fungicides," the first book dealing with this subject published in the United States. In addition he has written several other books, including "Chemistry of Insecticides, Fungicides, and Herbicides." Dr. Frear is Professor of Agricultural and Biological Chemistry at The Pennsylvania State University.

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room temperature and at 32° F. without salting out. Liquids that contained as little as 40 per cent of the total phosphate as polyphosphates usually stored for more than a year at room temperature, however, they usually salted out in 1 to 3 months at 32° F. Samples of 190 shipments of 11-33-0 were stored at 32° F. Two of these samples salted out in 1 month, six in 2 months, and, by the end of 6 months, twenty-five had salted out. The polyphosphate contents of these liquids ranged from about 40 to 47 per cent of the total phosphate.

The nominal 11-33-0 grade liquid has been shipped to forty-five companies in nineteen states for use in the production of high analysis liquid fertilizers and as a sequestrant in the production of high-analysis liquid fertilizers and as a sequestrant in the production of liquid fertilizers from wet-process phosphoric acid. Only minor difficulties have been experienced with salting out; these difficulties occurred in extremely cold weather with products that were low (about 42%) in polyphosphate content.

After about 2½ years of operation, consideration is being given to changing the grade of the liquid from a nominal 11-33-0 to a 10-34-0. The latter grade has better storage properties at low temperatures (down to 0° F.) because of a combination of maximum solubility in the pH range of 5.8 to 6.0 and good supercooling properties.

Acid Specifications

In order to produce a liquid that contains at least 50 per cent of the total P_2O_5 as polyphosphates, the acid used should contain at least 76 per cent P_2O_5 (*1*). The crystallization temperature of superphosphoric acid is about 60° F. at a concentration of about 76.0 per cent P_2O_5. However, the acid has a strong tendency to supercool, and it can be exposed to lower temperatures for considerable time without much danger of crystals forming. Provision always should be made for heating superphosphoric acid in the event that it should crystallize.

Agronomic Value

Agronomically, when considering both published (*2*) and unpublished data, the P_2O_5 in liquid fertilizers made from superphosphoric acid is at least as effective as that in concentrated superphosphate and other water soluble solid fertilizers.

Conclusions and Discussion

For best results in the production of liquid fertilizer from superphosphoric acid, a heel of previously prepared liquid first should be charged to the reactor so that vigorous agitation can be established. The formulated amounts of ammonia, superphosphoric acid, and water then should be added simultaneously so as to maintain the desired pH (6.0-6.3 for 11-33-0; 5.8-6.0 for 10-34-0). The water addition should be controlled so that the specific gravity of the liquid is about 1.342 at 180° F. for 11-33-0 or 1.338 for 10-34-0.

The superphosphoric acid should contain at least 76 per cent P_2O_5 so that at least 50 per cent of the total phosphate in the product is present as polyphosphates. It is important that superphosphoric acid not come in contact with water before ammoniation since the polyphosphates will hydrolyze to orthophosphate.★★

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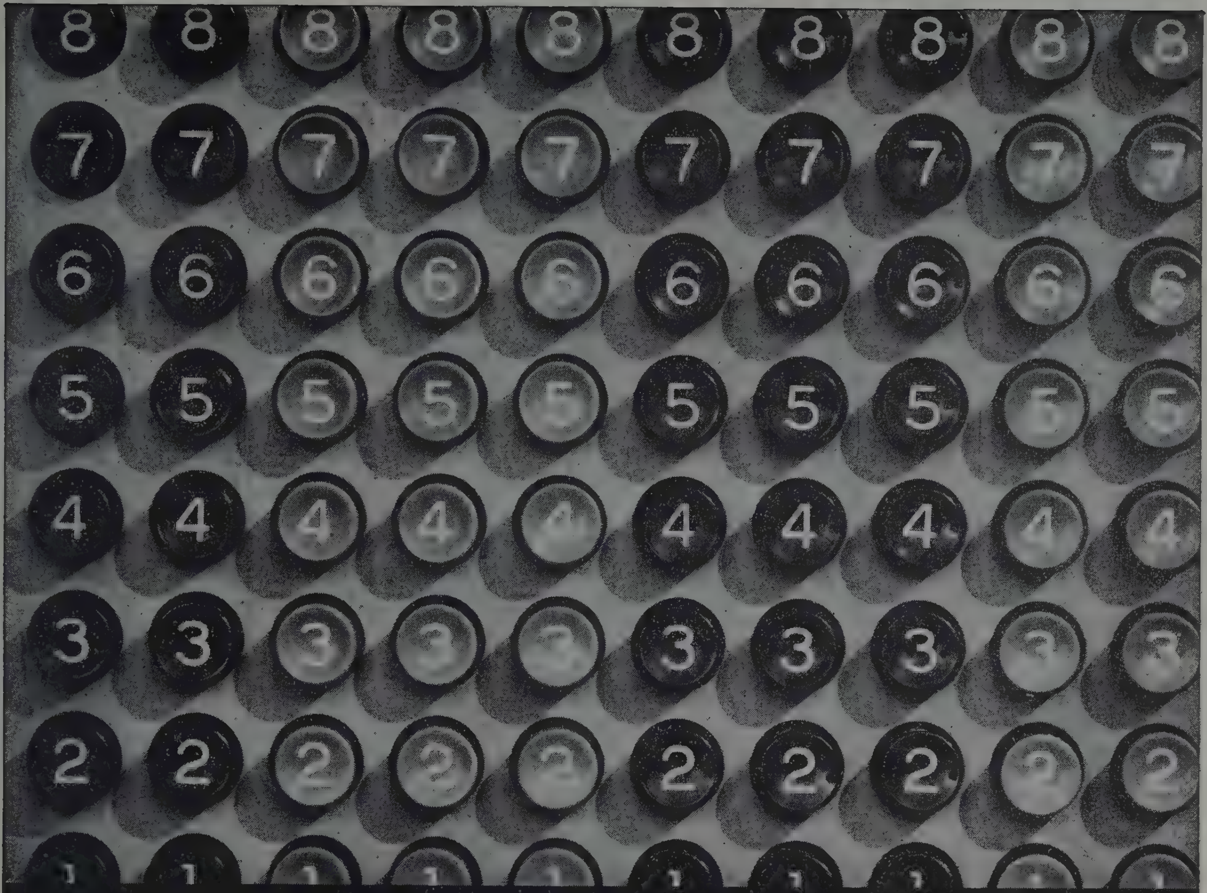

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FERTILIZER CONSUMPTION

(From Page 37)

cent) of the nitrogen, 523,000 tons (20.4 percent) of the available P_2O_5, and 271,000 tons (12.1 percent) of the K_2O. Of these nutrients, only nitrogen was supplied in increased amounts, principally through increased use of anhydrous ammonia, nitrogen solutions, urea, and the ammoniated phosphates. Decreases in the consumption of P_2O_5 and K_2O in direct application materials largely were associated with decreases in the direct use of basic slag, calcium metaphosphate, phosphate rock, and potassium chloride.★★

FARMER ATTITUDES

(From Page 15)

tilizer application indicates that many farmers perceive fertilizer cost as prohibitive to higher application or they may feel they already are using optimum fertilizer levels (few actually are doing so.) Responses to the sentence completion question, "I'd use more fertilizer, but . . .," are shown in Table I.

The chief anxieties of farmers regarding fertilizer use are burning their crops, getting proper application, and obtaining the greatest return from their fertilizer investment. Undoubtedly, more complete information about fertilizer on such topics as fertilizer placement, and the elements of plant nutrition could help to neutralize many of these negative attitudes.

Table II shows farmers' source of information about fertilizer. Fertilizer dealers and salesmen were named by 32 per cent of the farmer respondents as their most important source of information. This indicates greater importance for commercial sources of information than has been found in previous studies.

This Ohio State fertilizer use demonstration study illustrates the level of cooperation that can be obtained among industry, extension, and research workers and the far-reaching effects of such cooperation. In spite of the general trend of American farmers to use higher rates of fertilizer applications, they still do not use optimum amounts. Many farmers are using much less fertilizer than the amount that would net them the best returns in relation to other crop production tools. The dramatic increase in fertilizer use achieved in Miami County in only two years is an indication of the results that might be expected from large-scale cooperation between industry and agricultural extension.★★

DEFOLIATION

(From Page 60)

supplies in the soil are excessive at the time of defoliation, or if too long a time elapses between defoliation and picking. This, in turn, may result in green-leaf stain in machine picked cotton. This problem can be held to a minimum through careful attention to the factors discussed above.

Effects on Fiber Quality

Any discussion of defoliation would be incomplete without some mention of effects which defoliation has on fiber quality. Favorable effects—more rapid drying and opening of mature bolls, fewer green leaves and general debris, reduced boll rots, etc.—are well known and appreciated. Possible unfavorable effects on fiber quality merit a few comments, however.

Defoliation or desiccation has no deleterious influence on cotton in bolls which are open or which are fully mature, although not yet open at the time of defoliant application. This was the conclusion drawn from results of 11 tests in five states over a three year period reported by Tharp, Thomas, Walhood, and Carns.[2] Premature defoliation had a definite effect on some fiber properties, but no observable effect on others. The effects which were reported are summarized below:

Length. The upper half mean length of cotton fibers was not significantly affected.

Strength. Effects of premature defoliation on fiber strength were variable. In no case were the fibers weakened, and in some cases significantly stronger fibers resulted.

Fineness. In 6 of 10 tests, premature defoliation resulted in significantly finer fibers.

Spinning Qualities. Yarn skein strength was not consistently altered by premature defoliation.

Yarn appearance was not consistently altered when tests were viewed on a total crop basis. Considering only effects on late-harvested cotton, however, a distinct trend toward lowering of yarn appearance grade was noted where cotton was defoliated prematurely.

Picker and card waste also showed little effect of premature defoliation, but there was a trend toward increased waste on early-defoliated, late-harvested cotton.

Neps were rather consistently increased by early defoliation.★★

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EDITORIAL

(From Page 13)

suppliers, who compete against co-ops for markets among farmers, have long complained that this puts them at a serious disadvantage, and also deprives the government of needed tax receipts. And it is always worth remembering in connection with taxes that when one group of citizens gets off without paying taxes they should pay, the rest of us must pay more than our fair share.

The President feels that the law should be clarified to require patrons of co-ops to pay a tax on earnings allocated to them as dividends or refunds, even if they don't actually receive them. This would put an end to the practice of co-ops retaining the earnings as a free source of corporate capital, and no tax being paid to the federal government. Such a change in tax policies, we feel, has long been needed.★★

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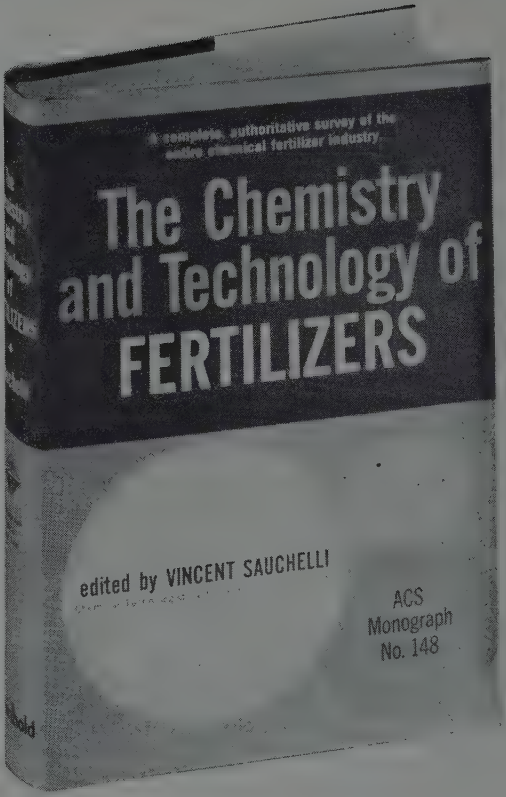
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TALE ENDS

EVIDENCE that more and more attention is being paid by the agricultural chemicals industry to the exploding home garden market can be found in the May issue of *Reader's Digest.* An article by Frank J. Taylor discusses the history of garden pesticides and reports that "Today, as a result of invention and discovery, they (home gardeners) can at last expect to win the battle, (against pests) and without exhausting labor."

The article goes on to explain about the wartime discovery of DDT and BHC and recounts the factors that led to the development of such pesticides as methoxychlor, lindane, Malathion, Tedion, Chlordane, Dieldrin, and Captan. These chemicals not only *control* garden pests, but, in what must be the language of the home gardener, they "clobber," "knock out," "wipe out," "destroy," and "guarantee sudden death" to bugs. Mr. Taylor also lists some of the selective herbicides that are available for home use.

"Chemists and engineers," Mr. Taylor concludes, "have come a long way toward the lazy homeowner's ultimate dream of a garden as a bit of paradise that will take care of itself."

AC

In the same regard, "Chemical Week" last month reported that manufacturers of pre-emergent-type herbicides are conducting a promotional campaign to push sales into the $15 million per year range; half again the 1960 mark. The prime markets are in the Northern states, where crab grass is being widely advertised as the No. 1 turf problem.

Among the companies newly-entering the home-owner crab grass market are: Dow, with Dow Crab Grass Killer; Diamond, with Dacthal; Eli Lilly, with Greenfield Crab Grass Killer; Amchem, with No-Crab; and O. E. Linck, with Enz. And, the report states, more are coming

A word of caution, however, comes from a USDA representative who is quoted as saying that most homeowners don't need crab grass killers; they simply need to take better care of their lawns.

AC

Chemical sterilants — newest of the insect control methods—and a promising improvement on radiation sterilization, are being intensively studied at the Orlando, Fla., laboratory of the USDA's Entomology Research Division. Work there has turned up at least three promising compounds. They are ethylene imine derivatives that have previously been studied as cancer-fighting agents.

AC

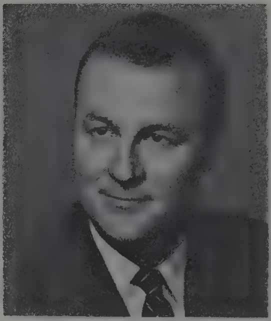
China Pictorial, an English-language magazine published in Red China, continually tells of China's rich harvests and happy peasants in glowing terms that sometimes are at variance with reports of Chinese farm disasters and famine carried in the U. S. press. A photograph of people's commune members sowing winter wheat by a "streamlined" method shows three horses pulling what appears to be an extremely rustic harrow to which a hopper has been added. Another "excellent" farming method illustration shows the Pakuating Production Brigade disinfecting the land with 666 insecticide. The Brigade is shown using vintage hand-dusters.

AC

A Westville, Indiana, farmer last month was awarded 40 tons of fertilizers as the grand prize in Spencer Chemical Co.'s fertilizer "pledge" contest. The contest entry blank asked farmers to pledge to consult their fertilizer dealer about proper plant food use.

AC

The importance of Latin America as a potential market for chemical fertilizers is emphasized in the March 18 *Chemical Week*, which points out that the use of fertilizers in South America is only about 1 per cent of the economic optimum rate. There are, however, obstacles to be overcome before this virtually untouched market can be exploited. The great mass of the farming population is uneducated in modern farming methods and is too poor to invest in fertilizers or other production aids. In addition, overproduction of such basic crops as coffee and cotton tend to discourage more fertilizer use.



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I find Agricultural Chemicals *especially helpful in keeping us informed on new products and new developments in the chemical field. Our research and development department personnel, as well as those in our chemical division, also are enthusiastic readers. We have just added an agricultural chemicals department to our feed and fertilizer division. In the future, therefore, we shall be even more avid readers of* Agricultural Chemicals *than we have been in the past, if that is possible.*

The Rath Packing Company, Waterloo, Iowa, operates the largest meat packing plant in the United States and has been a pioneer of modern marketing methods. They were the first to market nationally hickory smoked ham in cans, for example, one of the first to sell bacon in recloseable cartons, the first to dry-cure heavy bacon, and among the first to ship by refrigerated rail car to the West Coast. Rath Packing Company recently added an agricultural chemicals department that produces a line of animal health products, pesticides, herbicides, cleansers, and sanitizers.

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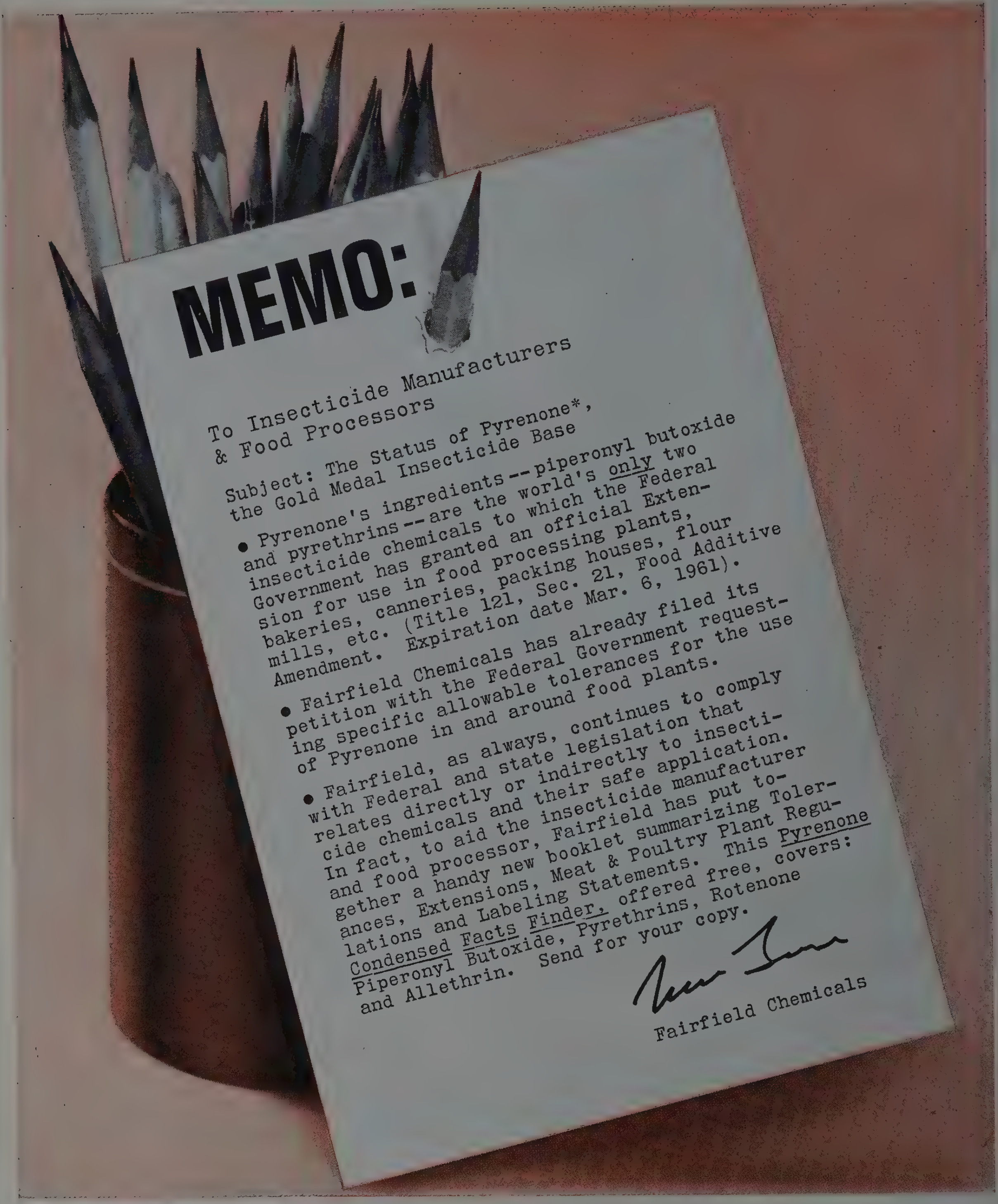

MEMO:

To Insecticide Manufacturers
& Food Processors

Subject: The Status of Pyrenone*,
the Gold Medal Insecticide Base

- Pyrenone's ingredients--piperonyl butoxide and pyrethrins--are the world's only two insecticide chemicals to which the Federal Government has granted an official Extension for use in food processing plants, bakeries, canneries, packing houses, flour mills, etc. (Title 121, Sec. 21, Food Additive Amendment. Expiration date Mar. 6, 1961).
- Fairfield Chemicals has already filed its petition with the Federal Government requesting specific allowable tolerances for the use of Pyrenone in and around food plants.
- Fairfield, as always, continues to comply with Federal and state legislation that relates directly or indirectly to insecticide chemicals and their safe application. In fact, to aid the insecticide manufacturer and food processor, Fairfield has put together a handy new booklet summarizing Tolerances, Extensions, Meat & Poultry Plant Regulations and Labeling Statements. This Pyrenone Condensed Facts Finder, offered free, covers: Piperonyl Butoxide, Pyrethrins, Rotenone and Allethrin. Send for your copy.

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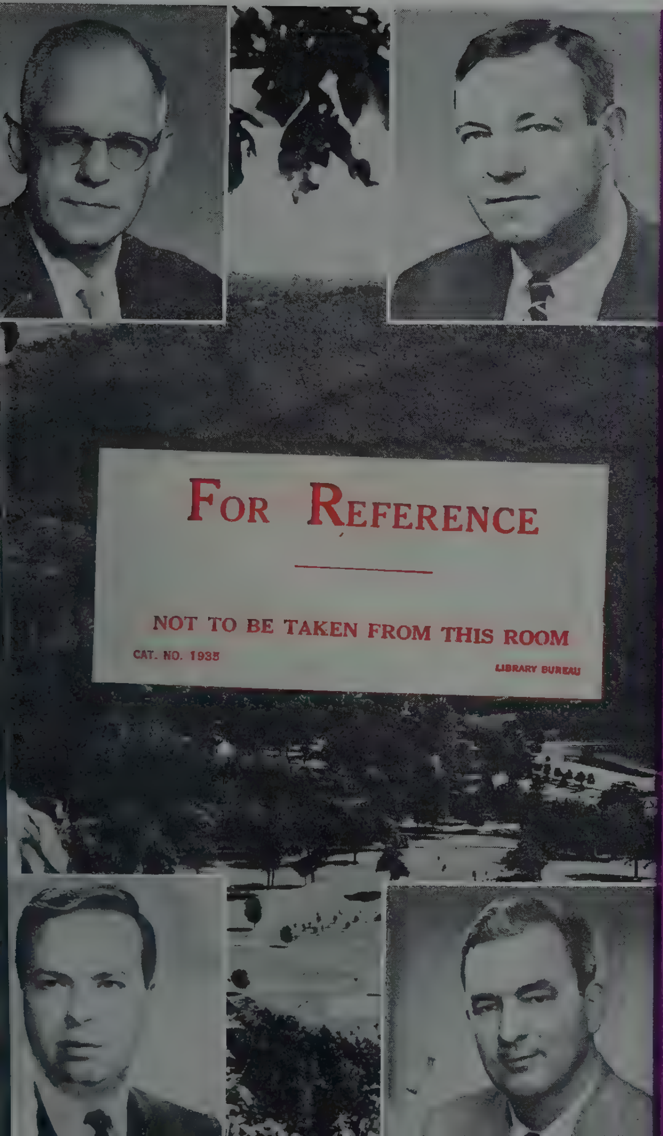

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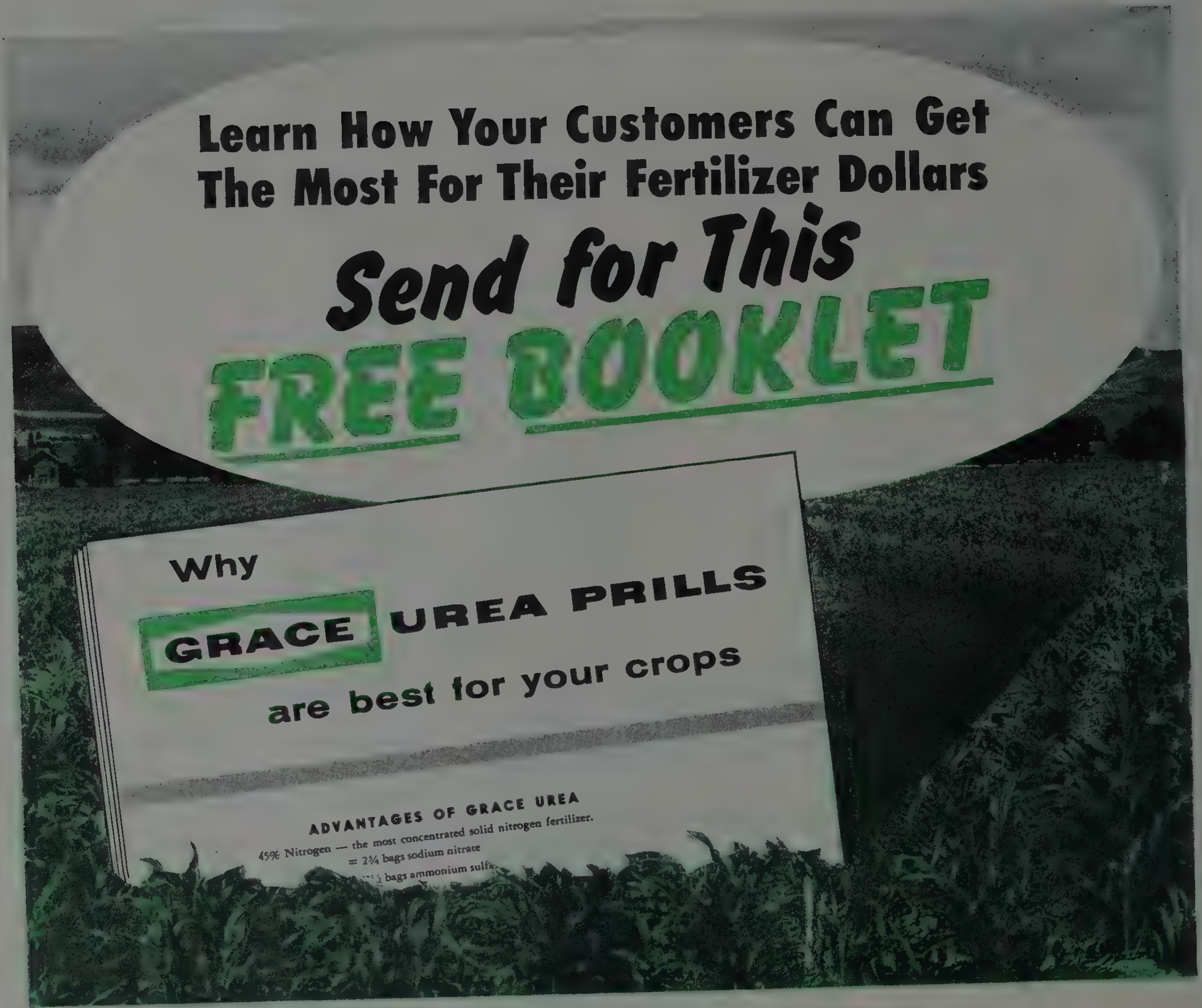
In this issue:

Fertilizer Standardization Survey
World Pesticide Markets
Armour Begins Construction
Carbamate Insecticides
Problems In Multiwall Handling
CSMA Mid-Year Meeting
Fertilizers in Italy
Influence of Dealers
NPFI To Meet At Greenbrier
GLF Home & Garden Store

CUSTOM APPLICATOR SECTION

June 1961



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This Month's Cover

Shown against the background of the Greenbrier, nestled in the Allegheny Mountains of West Virginia, are four of the speakers for the June 11 meeting of the NPFI. Starting at top left, they are, clockwise: William M. Fifield, Henry L. Ahlgren, Dr. Pierre Andre Rinfret and J. E. Streetman. See story on page 19.

AG CHEM

Vol. 16, No. 6 June, 1961

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Wayne E. Dorland

Managing Editor
Richard D. McNally

Technical Editor
Eleonore Kanar

Western Representative
Edward Meier

Advertising Manager
Ralph Dorland

District Manager
Paul Geiger

Circulation Manager
David Tryon

PUBLISHED monthly on the 1st, by Industry Publications, Inc.

ADVERTISING and Editorial Office, P. O. Box 31, Caldwell, New Jersey.

PUBLICATION Office: 123 Market Pl., Baltimore, Md.

ENTERED as second-class matter November 4, 1949 at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

SUBSCRIPTION RATES: United States, 1 year, $4; 2 years, $7. Canada, 1 year, $5; 2 years, $9. Pan American countries, 1 year, $7; 2 years, $12. All other foreign countries, 1 year, $12; 2 years, $20.

SINGLE COPIES: current issue: $0.50; all back numbers $1.00. Postage and handling charges for foreign countries on single copies: $1.00. Claims for missing numbers will not be allowed if received more than 60 days from date of mailing. No claims allowed from subscribers arising from failure to notify the Circulation department of a change of address, or because a copy is "missing from files."

ADVERTISING RATES known on request. Closing date for copy—5th of month preceding month of issue.

MEETING CALENDAR

June 5-7 — Southern Feed, Fertilizer, and Pesticide Control Officials, Annual Meeting, Lafayette Hotel, Lexington, Ky.

June 6-7 — Summer Meeting, Georgia Plant Food Educational Society, Wanderer Motel, Jekyll Island, Ga.

June 9-17 — European Congress of Chemical Engineers and ACHEMA Congress 1961, Frankfurt am Main, Germany.

June 11-14 — Annual convention, National Plant Food Institute, The Greenbrier, White Sulphur Springs, W. Va.

June 20-22 — Pacific Branch, Entomological Society of America, Miramar Hotel, Santa Barbara, Calif.

June 24 — Del-Mar-Va Peninsular Fertilizer Association, George Washington Hotel, Ocean City, Md.

June 27-29 — Twelfth Annual Fertilizer Conference of the Pacific Northwest, Marion Hotel, Salem, Oregon.

July 19-21—Fertilizer Management Seminar, International Minerals & Chemical Corp., Skokie, Ill.

July 19-21 — Southwest Fertilizer Conference and Grade Hearing, Galvez Hotel, Galveston, Texas.

Aug. 7-9—Symposium on Pesticide Residues, 18th International Congress of Pure and Applied Chemistry, Montreal, Canada.

Aug. 27 - Sept. 1 — Annual Joint Meeting of Biological Societies, Purdue University, Lafayette, Ind.

Sep. 3-8 — 140th National Meeting, American Chemical Society, and National Chemical Exposition, Chicago.

Sept. 18-20—Canadian Agricultural Chemicals Assn., 9th Annual Meeting, Mont Tremblant Lodge, Mont Tremblant, Quebec.

Oct. 2-6—National Hardware Show, McCormick Place, Chicago.

Oct. 9-10 — Four-State Applicators & Chemical Conference, Chinook Motel and Tower, Yakima, Wash.

Oct. 9-11—Western Agricultural Chemicals Association, Annual Meeting, Hotel Claremont, Berkeley, Calif.

Oct. 16-18 — Entomological Society of Canada, Entomological Society of Quebec, Joint Meeting, Quebec, P.Q., Canada.

Oct. 20-22 — Eastern Lawn, Garden, and Allied Products Trade Show, Coliseum, New York.

Oct. 29-Nov. 1 — National Agricultural Chemicals Association, 28th Annual Meeting, The Homestead, Hot Springs, Va.

Oct. 31-Nov. 2—National Fertilizer Solutions Association, Annual Convention, Edgewater Beach Hotel, Chicago.

Nov. 2-3 — Pacific Northwest Plant Food Association, annual convention, Hotel Gearhart, Gearhart, Oregon.

Nov. 6-7 — Annual Weed Conference, Washington State Weed Association, Chinook Motel and Tower, Yakima, Wash.

Nov. 7-10 — British Insecticide & Fungicide Conference, Brighton, England. Sponsored by Association of British Manufacturers of Agricultural Chemicals.

Nov. 8-10—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 12-14 — 38th Annual Convention of California Fertilizer Association, Jack Tar Hotel, San Francisco.

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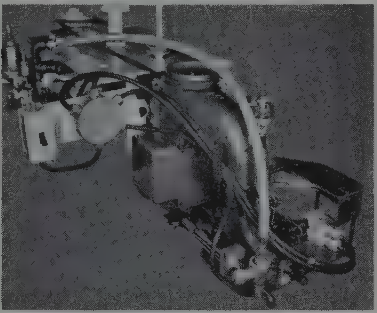

The I&C Acto-Cutter automatically starts and stops sewing action and cuts threads between bags. An outstanding time and labor saver.

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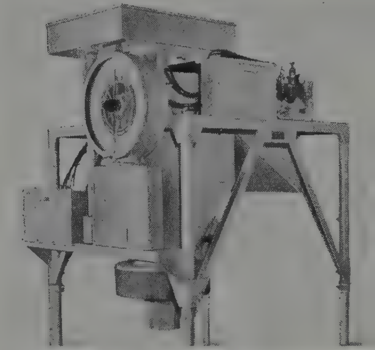

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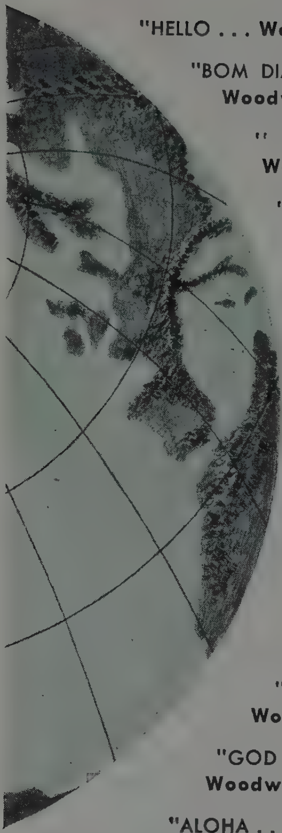

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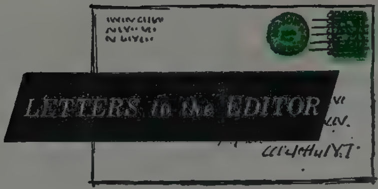

Crop Controls And Chemical Sales

STUART L. Spradling, director of research for the M-F-A Oil Company, Columbia, Missouri, has written *Agricultural Chemicals* regarding our April editorial dealing with the new Kennedy farm program and its effect, if any, on the sale of agricultural chemicals. Mr. Spradling observes that if all United States farmers were using chemicals at optimum rates to get lowest per unit production cost, any production control program, whether based on acreage restrictions or quotas, on per bushel or per pound basis, would reduce chemical usage.

He points out, however, that since only a small percentage of farmers are near the threshold of optimum chemical usage, production quotas based on bushels and pounds should encourage farmers toward this optimum usage and, actually, increase chemical sales. Chemical tools, he argues, simply enable a vast percentage of U. S. farmers to grow their allotment on fewer acres and thus minimize the tillage, planting, and harvesting costs per bushel.

Mr. Spradling recommends that a conscientious, industry-wide effort be made to promote chemical usage for optimum economic return to the farmer, although he cautions against the encouragement of farmers to purchase chemicals whose use will not result in a net profit. Such a program, he points out, coupled with satisfactory production controls and increased farm prices, will be beneficial both to agriculture and to the chemical industry.

We can only agree with Mr. Spradling in this regard, although we believe he has misinterpreted our April editorial as a criticism of the Kennedy approach to control crop surpluses. What we said essentially was that the Kennedy approach will be on a different basis than the previous farm program and that manufacturers of fertilizers and pesticides may soon learn whether their sales will be affected. We did not say that farmers *would* necessarily use less fertilizers on more acres but rather that they *might* do so.

We, of course, do not feel it makes sense for farmers to use less fertilizer simply because they are able to farm more acres, but there are indications that in actual practice things may work out this way. 1961, which promised to be a record season for fertilizer sales, now is being regarded by many producers as being little better than average because of the government's grain bank program which is encouraging farmers to divert corn acreage to other crops and, thus, reduces the demand for potash in fertilizer formulations.

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National Plant Food Institute, 1700 K St., N.W., Washington, D. C. Paul Truitt, president.

American Potash Institute, 1102 16th St. N.W., Washington 6, D. C. H B. Mann, president.

American Society of Agronomy, 2702 Monroe St., Madison, Wisc. Dr. Matthias Stelly, exec. sec.

American Phytopathological Society, S. E. A. McCallan, secretary. Boyce Thompson Institute, Yonkers, N. Y.

American Chemical Society, 1155 16th St., N. W., Washington, D. C.

Association of Official Agricultural Chemists, P. O. Box 540, Benjamin Franklin Station, Washington, D. C. William Horwitz, secretary-treasurer.

Agricultural Ammonia Institute, Hotel Claridge, Room 305, Memphis, Tenn. Jack Criswell, executive vice-president.

American Society of Agricultural Engineers, F. B. Lanham, secretary, 505 Pleasant St., St. Joseph, Mo.

Carolinas-Virginia Pesticide Formulators Association, 516 S. Salisbury St., Raleigh, N. C. Hugh Horn, secretary-treasurer.

California Fertilizer Association, Sidney Bierly, executive secretary, Room 213, Ochsner Building, 719 "K" Street, Sacramento, Calif.

Chemical Specialties Manufacturers Association, 50 East 41st St., New York City. Dr. H. W. Hamilton, secretary.

Entomological Society of America, 4603 Calvert Rd., College Park, Md. R. H. Nelson, secretary.

National Fertilizer Solutions Association, 2217 Tribune Tower, Chicago, Ill. M. F. Collie, secretary.

National Cotton Council, P. O. Box 9905, Memphis, Tenn.

Soil Science Society of America, 2702 Monroe St., Madison, Wisc. L. G. Monthey, exec. sec.

Sulphur Institute, 1725 K. St., N.W. Washington 6, D. C. Dr. Russell Coleman, president.

Weed Society of America, W. C. Shaw, secretary, Field Crops Research Branch, Beltsville, Md.

Western Agricultural Chemicals Association. Charles Barnard, executive secretary, 2466 Kenwood Ave., San Jose, Calif.

In the Spotlight this Month

- **Standardization** . . . The question of whether or not there is a need for standardization of raw materials in the fertilizer industry has been the subject of many discussions since it was brought up last November at the Fertilizer Round Table. Agricultural Chemicals has conducted a survey to determine the sentiments of those actually involved in fertilizer formulation. Part one of a two-part report. Page 14.

- **World Pesticide Market** . . . A first-hand report by a pesticide industry official who has travelled widely abroad indicates that there exists a great opportunity for pesticide sales to under-developed nations. There are pitfalls, however. Page 17.

- **Carbamate Insecticides** . . . The successful development of Sevin as a commercial insecticide has highlighted the potential importance of the aryl *N*-methylcarbamates for insect control. A number of them are described by a leading authority. Page 20.

- **Proper Bag Handling** . . . Some of the problems occasionally encountered in the handling of multiwall bags could be avoided if the packer became more familiar with the capabilities of the container and followed the fundamental rules for handling multiwalls. Page 27.

- **Influence of Dealers** . . . The results of a survey of fertilizer dealers in South Carolina indicate that they play an important role in influencing farmers about fertilizer use. Page 33.

- **Fertilizer Production in Italy** . . . The expansion of production of chemical fertilizers in Italy is a main feature of the growth of the Italian chemical industry. In addition, Italian chemical fertilizers now are being exported in increasing quantities to foreign markets. Page 40.

- **The Ag Chem Dealer** . . . A distinguishing feature of the first GLF home and garden store to be located in a shopping center is the staff of more than 20 experienced employees who are capable of helping home owners with their lawn and garden problems. Page 47.

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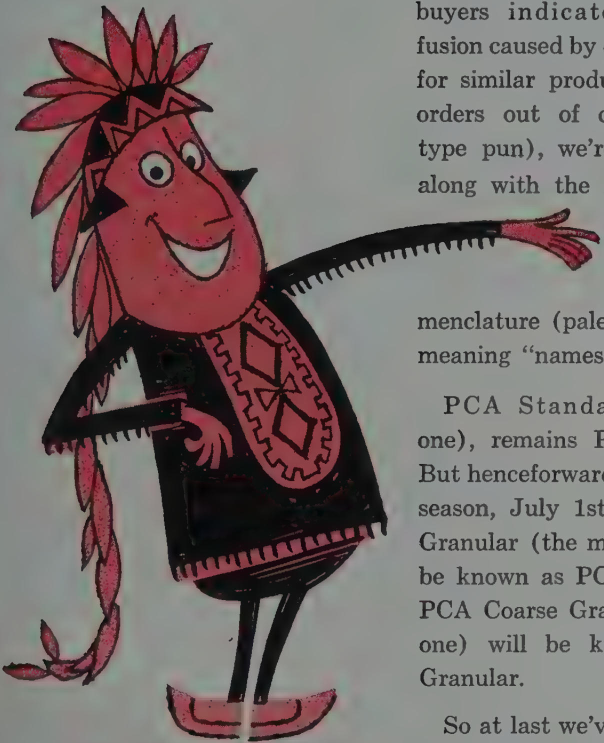

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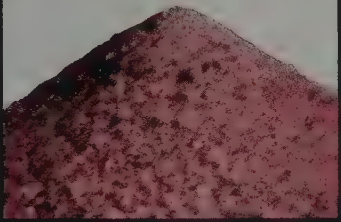

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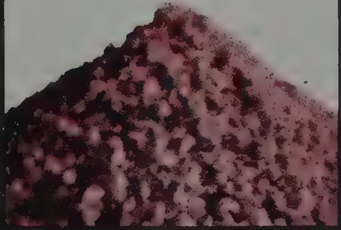

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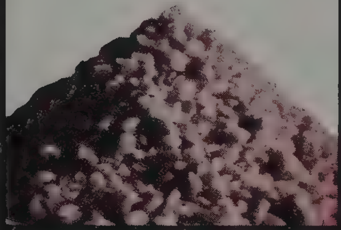

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GUEST EDITORIAL

By J. D. Stewart, Jr.
Chairman of the Board
National Plant Food Institute

THE end of the fertilizer year is always a good time to take stock and consider the future. As the industry rises to new highs in terms of plant nutrients, new and perplexing problems often appear.

Now is the time to review, analyze, and sharpen our tools to build for next year.

Essentially, we in this industry are builders. We are builders of a more efficient agricultural productive system, of a more prosperous agriculture, and of a steady high-quality supply of food and fiber for a growing nation. All of this is being achieved at a reasonable cost to consumers.

Since the National Plant Food Institute was created, in 1955, it has grown in stature. It has served and will continue to serve the industry in many areas. These include agronomy, agricultural economics, publicity and public relations, governmental affairs, chemical control, and cooperation with other scientific and professional organizations serving agriculture. To this we are dedicated, but the task is neither simple nor easy. Our dollars must be stretched. We do not worship the status quo. Neither do we believe in change for its own sake. We shall strive to see to it that change in the Institute's program represents progress and motion in the right direction. Akin to this point, our Board believes that our program should include those industry activities and functions which may best be legally performed by the group as a whole and should exclude those activities and functions which may best be performed by members individually. The broadest support from all segments of the industry is urgently desirable to permit the Institute to reach its full potential.

Other problems besides cost and support should not be overlooked. As an industry, we are passing into a new era with reference to agricultural legislation. The "New Frontier" is moving down onto the farm as well as into high places in politics, government, and finance. New regulations will bring changes yet undefined to our industry. These will call for alertness and ingenuity on our part.

Technological developments continue apace. Newer products and newer marketing programs continue to affect us, as producers, and our customers, the farmers. The need for educational work as a basis for good merchandising continues high.

In the manufacturing and chemical control areas, work to refine analytical methods and to teach new procedures to chemists should be accelerated. This is one productive way to cut costs and nourish net profits.

As we look to the 1961-62 fertilizer year, clearly the signal now is for vision, good planning, and hard work. Let us never forget that fertilizer still is the farmer's best buy. It is his best cost-cutting tool. No other investment pays him such a high rate of return. We have utmost confidence in the future of the fertilizer industry because profitable farming is basic to a sound national economy, and fertilizer is basic to profitable farming.★★

Mr. Stewart is president of Federal Chemical Company, Louisville, Ky.

An Exclusive Survey

STANDARDIZATION

Is It Desirable In Fertilizer Materials?

The arguments in favor of more-uniform fertilizer raw materials point to the benefits of a relatively uniform raw material supply that will enable the formulator to count in advance on what he will be getting in the next delivery of raw materials, regardless of the supplier from whom they were purchased, and formulate accordingly.

Some fertilizer mixers and suppliers, however, in response to an Agricultural Chemicals survey, feel that this ideal situation is one which might, in actual practice, turn out to be neither possible nor desirable. What is generally agreed upon is the need for standardization of terminology. (Part I of a two-part report.)

WHAT does the fertilizer industry in general think about uniform nomenclature for the raw materials it buys, standard specifications for these materials, standard test methods and perhaps a greater degree of standardization in the products themselves? *Agricultural Chemicals* has been seeking some of the answers to this group of questions since a Panel of Users at the Fertilizer Round Table last November first raised this issue. (See *Agricultural Chemicals,* Dec., 1960, pp. 30-32 and April, 1961, pp. 13, 46-47.)

The arguments in favor of more uniform raw materials were outlined fully in our previous coverage of the subject. What proponents of the idea are seeking is apparently a relatively uniform raw material supply, so that they can count in advance on what they will be getting in their next delivery of raw materials regardless of the supplier from whom purchased, and can formulate accordingly. To judge from some of the opinions expressed by fertilizer mixers and suppliers alike, in our continuing investigation of the subject, however, this ideal situation is one which might, in actual practice, turn out to be neither possible nor desirable.

Commenting in this vein, Harry L. Cook, director of research and technical services for the Fertilizer Manufacturing Division of The Farm Bureau Cooperative Association, Columbus, Ohio, says: "With regard to standardization of terminology, I see no justification for all the confusion in this area. The industry is laggard in not working out standard terminologies. From the standpoint of standardization of product, however, I do not feel this is practical from an economic standpoint, or possibly even desirable. If it were attempted, we would encounter a situation in which not all suppliers could meet the highest standards. Thus we would inevitably end up setting standards which would be lower than the average the industry can meet. This would be going backwards. The simple way to control standards of raw materials is not to buy from those suppliers who cannot meet your requirements."

Somewhat the same sentiments were expressed by a supply representative, who indicated that he preferred not to be identified. He gave a strong "yes" to standardization of terminology, but added, "Heaven forbid product standardization. Let's hope the basic producers do not allow themselves to be bullied or threatened into panic on this business. They took more on the chin during the Round Table discussion than was necessary. You can hardly blame them for being 'gun shy' or, as your article says, 'somewhat uncommunicative.' If you will ask a panel of fertilizer *retailers* what they think of standardization of the product they sell, perhaps they too will become uncommunicative. I hope you don't think this is a smart-aleck answer to your serious and well thought out article. It isn't meant to be. Keep up the good work."

This supplier was not alone in being unwilling to comment publicly on the subject. Another correspondent stated, "Our company has decided that my opinion regarding standardization in nomenclature and materials had best not be published, lest it offend some of our customers, as well as control officials. My views were that rather sweeping changes should be made in our nomenclature, but were against standardization of quality."

Rigid Standardization Not Required

ANOTHER opinion opposed to standardization of industry products was registered by Philip B. Turner, general manager, Aroostook Federation of Farmers, Caribou, Maine, who advised that he spoke from experience as both a buyer as well as a seller of raw materials. In his opinion, "The fertilizer industry does not require nor warrant, economically, rigid standardization of materials. Rather standardization of measurement is indicated so that the manufacturer will know he is buying materials suitable to his needs.

"Let us consider first the basic plant food elements: nitrogen, phosphorus and potash. Most of the nitrogen used in the fertilizer industry is derived from synthetic sources. It is manufactured as urea, ammonium nitrate, ammonia, etc. These materials in combination result in either dry nitrogen sources or solution sources which are suitable for large plants, small plants, modern plants or old, non-modern plants. Each ratio, each grade and each type of plant has particular requirements; for example, 3-18-9 would require a high amount of free ammonia, whereas 15-10-10 requires a large amount of fixed nitrogen. I believe standardization of nomenclature is required in this field. This, of course, has already been attempted, with partial success. The standardization of nitrogen materials has been pretty well accomplished.

"The phosphate materials do not lend themselves to standardization because they are minerals that are mined. These natural ore bodies contain varying quantities of phosphorus. I will agree with the panel that a 20% superphosphate and a 46.5 triple would be ideal from the manufacturers' point of view. From the purchasing point of view, considering freight and its reflection in cost, I want the highest analysis available. However, there are times when a superphosphate of 18% P_2O_5 would suit the manufacturing needs, such as grades containing small amounts of phosphorus as 10-3-7. If the cost of putting all super and triple into a standard chemical analysis and physical analysis, allowing a variable of 0.5%, is to be passed on to the consumer, then the economics will need a rather complete study. It appears to me that the measuring and weighing which takes place in the present fertilizer factory is inadequate for standardized materials. I would like to know more about the physical characteristics of the product I am considering. Certain physical characteristics, as a fertilizer manufacturer knows, affect the chemical characteristics; therefore, ammonia sorption, screen size, free acid, and hardness of particles should be designated.

"Now, as for potash these materials have been worked upon by all the Fifth Ave. boys, given fancy names, etc., but really what affects their end use can be designated in two categories: (1) Their degree of fineness or coarseness and (2) The degree to which they are wet or resist wetting, since this affects granulation. Particle size has been considered at several Round Tables where participants discussed seeding granulation with granular potash and others pointed out that this technique is a poor substitute for good granulation procedures. I concur with the latter point of view. Description to the buyer should include sieve analysis of both granular and non-granular types, and some indication of the degree of wettability."

A vote for standardization of nomenclature was cast by W. B. Porterfield of Freeport Sulphur Co., New York, who said "I feel that standardization in nomenclature of fertilizer raw materials will be well received by the purchasing agents and users of these materials. It is very confusing, I am sure, for the fertilizer manufacturers to have a like material called by several different names by producers."

Similar Specifications Are Desirable

ANOTHER favorable comment on the move toward standardized nomenclature and specifications was registered by D. C. Washburn, Winona plant, Northwest Cooperative Mills, who said "It would seem to me that the nomenclature should be standardized and specifications for each grade somewhat similar. A coarse potash should have certain screen specifications, and so with granular or standard or any other particular designation. The nitrogen suppliers have set-up a system of nomenclature so that the whole industry can at least talk in the same language.

"The most important aspect of standardization from my own personal point of view would be on the analysis of the material purchased. For instance, I checked on a shipment of 18 cars of coarse potash we received shipped over a period of about 10 days. The analysis varied from 60.56 K_2O to 61.44 K_2O. If we use all the material directly from the car, we can utilize the plant food content, otherwise we are going to lose some of the plant food value.

Likewise, the analysis of wet process phosphoric acid varies greatly as to P_2O_5, and water content. Again we can minimize the loss due to difference in analysis, but we will necessarily incur loss of plant food value that we have purchased.

"As is well known, fertilizer manufacturers must guarantee a minimum analysis on all material we ship and we are not able to bill the customer for any overage in analysis we might supply. At the same time we may be penalized if we are below standard. The question I'd pose to producers is 'Cannot some way be found to minimize the difference in analysis of raw materials you produce?' "

Will Buyers Pay For Added Costs?

ANOTHER participant in *Ag Chem*'s symposium, Darwin DeLapp, group leader, fertilizer research, American Cyanamid Co., Stamford, Conn., speaks out like most others who registered their opinions, in favor of uniform terminology and standardization of test methods, but on standardization of raw materials he asks the important question as to whether or not the buyer is prepared to pay the necessary added costs. His full comments are as follows.

"Standardization of methods for the measurement of chemical and physical properties is a desirable and realistic objective. The procedures presently in use are fundamentally very similar and I would foresee no major obstacle to establishing a standard method on an industry-wide basis for most raw materials. The Association of Official Agricultural Chemists is already considered a final authority for analytical determinations performed on a host of agricultural chemicals.

"Uniform terminology also presents no insuperable difficulties, although it is difficult to stop using a particular name or designation that has become second nature by life long use. Fortunately, most experienced people have accepted the inevitability that to live means to change. Surely most will gladly use definitive, semantically accurate nomenclature, agreed upon by his colleagues for the purpose of insuring clear understanding between customers and suppliers.

"The desirability of further standardization of products requires a broad look at the overall situation. Many raw materials being supplied are not only of a standardized nature but are remarkably pure chemically. A moment's thought brings quickly to mind NH_3, NH_3NO_3, $(NH_3)_2SO_4$, urea, and the various grades of potassium materials. Historically, most of these products were first manufactured to meet the demanding needs of the chemical industry. They grew into the stature of major raw materials for the fertilizer industry only after technological developments reduced manufacturing costs significantly and the advantages of high analysis fertilizers became widely recognized. Superphosphate and triple superphosphate present a different aspect. These are made simply by mixing a mineral acid with a natural ore of varying composition, with the avowed objectives of (1) converting the phosphate values present in the ore into compounds that can be utilized by the growing plants and (2) at the *lowest possible cost*. These have been the criteria of successful production.

"We all know that these two objectives are now being met to the great benefit of the farmer and ultimately to the consumers of food and fiber nationwide. However, this direct process, aimed as it is at efficiency and low cost, does not readily lend itself to yield, for example, a particular particle size distribution nor an active ingredient content within a very narrow range. To accomplish such an additional goal will require further processing steps or perhaps preferably a radically revised process.

"How much are customers willing to pay for extra manufacturing cost in order to obtain a product of greater uniformity and possessing certain specified characteristics? This question lies at the heart of the free enterprise system and can only be answered in the market place. You can bet that every supplier is working to improve his own competitive position by product improvement. When the results from selling experience have with some degree of reliability determined the proper balance between cost and uniformity, it will be appropriate to take the next progressive step, that of product standardization."

Knowledge Of Characteristics Needed

FRANK T. Nielsson, International Minerals & Chemical Corp., plant food division, believes that the prime requisite is "accurate knowledge of the characteristics (chemical and physical) of each shipment. With that we can then live up to the extent of what we want to pay for definite specifications."

On the general subject of standardization and uniform nomenclature, Mr. Nielsson observes:

"I believe the Nitrogen industry has made the greatest strides in nomenclature. The new NPFI notation permits complete designation of product composition for liquids. However, it is extremely difficult to obtain particle size guarantees on solid materials. To obtain solid ammonium nitrate, urea, or ammonium sulfate in a given range of particle sizes, one has to contact a number of suppliers to discover which supplier has a product that happens to fall in the range in which you are interested.

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The World Pesticide Market

Ideally, agricultural nations abroad should be able to produce their own pesticide requirements. Until this has happened, of course, many agricultural areas must look to other countries for the chemicals they may need. For those looking for business abroad, however, quality should be the by-word.

by P. J. Reno
Hercules Powder Company

EGYPT is a country that in many ways is typical of nations overpopulated in the rural areas, and with too few jobs in industry to absorb a substantial percentage of its people. It represents countries that in many ways may be very important to the plans of American manufacturers of agricultural chemicals.

Agricultural authorities in Egypt are highly intelligent, hardworking, and devoted to the advancement of their agriculture. This is due not only to a well-developed sense of national pride, but also to a sincere interest on their part in the welfare of the individual farmer and the community that his produce serves. It is the rule, rather than the exception, to find that these agricultural leaders have earned advanced degrees from the finest universities of the world.

Egypt has done a remarkable job during the past few years in producing top yields of quality cotton through good utilization of pesticides. The approximately one and one-quarter million acres planted to cotton is the backbone of the Egyptian economy. (A remarkable job of mixing the modern with the desirable old practices has been done by them on this important crop.) More recently, they have learned that it is possible, using similar techniques, to increase yields of corn from 10 bushels to close to 100 bushels per acre, and Egypt soon will be close to self-sufficient in this commodity.

The proper use of pesticides can very quickly free many foreign areas from hunger, and this should come *before* mechanization. The next step should be an integration of agriculture with industry. Ideally, agricultural nations abroad should be able to produce their own pesticide requirements. However, until this has been accomplished, many agricultural areas will look to other countries for the chemicals they need.

The potential business that can be expected will depend on several factors . . .

1. How will the widespread use of pesticide materials dislocate the economy of the nation concerned?

2. The availability of the pesticide materials required.

3. The job-value of the specified pesticides.

4. The quality of the materials sold.

For those looking for business abroad, *quality* should be the by-word. They should be certain they can produce pesticides as specified, at a price they can be sure leaves a safe margin of profit. And, of course, they must be able to meet the delivery date, because time moves as inexorably overseas as it moves in the United States, and a pesticide delivered too late may leave a wake of starvation and misery.

In short, a manufacturer should not promise anything he can't fulfill, because repeat orders are important.

On a long-term basis, pesticide producers should get to know the countries with which they deal. They should study seriously whether they may have to become manufacturers in the country they expect to serve. This, of course, calls for a thorough knowledge of the country and its people.

A country with real problems and real opportunities is India, where agriculture is very largely geared to a wooden plow pulled by bullocks. The average farmer in India has slightly less than four acres. Indeed, with the equipment with which he has to work, he would be hard-pressed to take care of more than five or ten acres.

Pesticides were introduced to this agricultural economy only a few years ago, and, today, only two insecticides are produced in the entire nation. Several formulators convert these basic insecticides and a variety of imported materials into finished formulations, some of which are sold through local distributors, subdistributors, and dealers. About 75

From a talk presented at the March 4 meeting of the Western Agricultural Chemicals Assn., Anaheim, Calif.

> **Where there has been success in the sale of pesticides outside the United States, it has come only after hard work and years of patient waiting. There still is much hard work ahead, but the years of waiting appear to be near an end.**
>
> **P. J. Reno**
> *Manager, Agricultural Chemicals Division, Hercules Powder Co., Wilmington, Del.*

per cent of pesticide sales, however, are made directly to the state governments on a tender basis.

India is a vast nation, with about 300 million acres in cultivation. Some of the more important crops are rice, wheat, cotton, and peanuts. Cotton in India is faced with a severe bollworm and pink bollworm problem. Of the 20 million acres of cotton, however, only about 2 per cent receive *any* pesticide protection. Yields reflect this, with only 3.75 million 400-pound bales being produced on those 20 million acres. This amounts to about 75 pounds of lint per acre. U. S. production was 462 pounds per acre in 1959. Land in India is as good as it is in the U. S. Is it not possible for yields to be as high?

It would seem, therefore, that cotton in India is a very promising market for an American insecticide producer. The two materials now made in India cost about twice as much as they do in the United States. But, there are many pitfalls.

The foreign exchange situation in India is extremely critical. The government is attempting to increase local manufacture of all goods, and discourages imports. Actually, all pesticides now being imported are in technical form.

Communications in India could be very difficult for even the most ambitious staff of sales representatives. There are 15 states and six territories. Within this area, 14 main languages are spoken, with several hundred different variations of dialect.

The various Indian states are quite independent; each one tests and evaluates pesticides under local conditions. Each state, in turn, is divided politically into districts and sub-divisions, and, finally, into "Thanas" or blocks. Agricultural information is passed down this complex chain until it reaches village-level workers who disseminate agricultural and other information. Pesticide distribution follows this same pattern until materials get to a "union," a semi-governmental organization which sells to farmers. However, if a real disaster hits (such as a locust plague) the central government may supply aircraft and insecticides free.

Although the states actually purchase the finished pesticides, the central government contributes funds in a 50-50 ratio. The states say they are in the pesticide business because farmers would never have learned the value of pesticides if the states hadn't done the promotion and set up a distribution system featuring low prices through subsidies.

Although there are other problems facing a manufacturer who wants to do a business in India, the situation is not hopeless. Only about $1,500,000 worth of pesticides were imported into the country during 1959. Of this, one million was from the United States . . . double the amount imported from the U. S. five years before.

So, while India would be one of the most difficult markets of all to enter, it also presents one of the greatest potentials.

Another nation in that part of the world, Pakistan, also has a primitive agriculture. Like India, individual farms are small, with 95 per cent of the crops grown on farms of about three acres. There are two growing seasons in Pakistan; *Kharif* (from April to October—this is the season of the monsoon rains) when maize, wheat, cotton, rice, and sugarcane are grown; and *Rabi* (from November to March) when wheat and vegetables are grown during the lighter winter rains.

There are about 26 million acres under irrigation in Pakistan, with water supplied by the Indus river, which flows for 1,000 miles, and 4 other rivers. Rice and wheat are the two main crops, although there are about 3 million acres of cotton under cultivation.

Pesticides have been supplied to farmers free of charge in Pakistan during the past five years. This is part of a carefully planned program designed to introduce growers to the advantages of pest control. By 1965 the Ministry of Agriculture hopes that pesticides will be so popular that the government can turn over distribution and sale to private industry.

At the present time, 4 per cent of the cultivated acreage in East Pakistan, and 9 per cent in West Pakistan are treated with pesticides. By 1965 the government expects those figures to rise to 14 per cent and 16 per cent respectively.

During the next five years, the government expects the purchases of finished pesticides (mostly insecticides) to rise from the 1960-61 total of four million dollars to somewhere around nine million dollars.

These pesticides are all imports, with a large part of the bill

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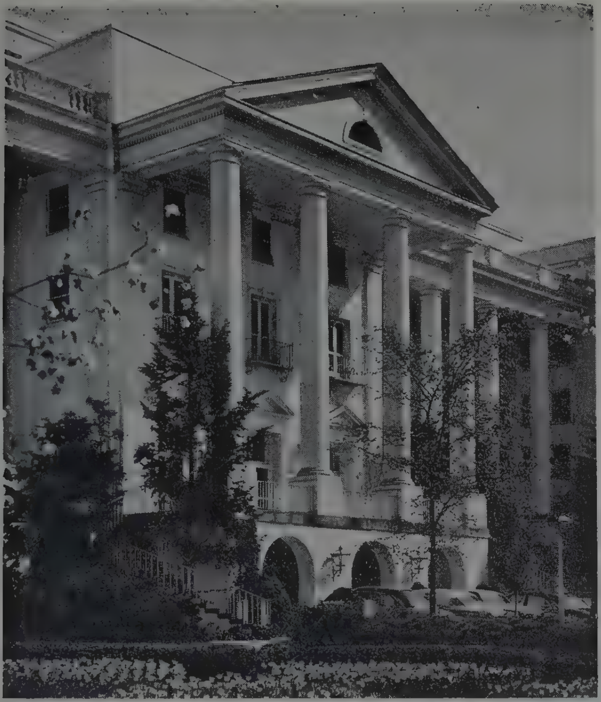

Speakers To Cover Farming & Business At NPFI Meeting

Among the topics scheduled to be discussed are: "Economics of Tomorrow," "Coming Developments in Farming," and the "Future Role of Agricultural Extension." The Board of Directors will meet on June 11 and 14.

SECRETARY of Agriculture Orville L. Freeman will be among the speakers at the annual convention of the National Plant Food Institute, to be held at The Greenbrier, White Sulphur Springs, W. Va., June 11-14.

The program for Monday, June 12 will include: Welcoming remarks by J. D. Stewart, Jr., Federal Chemical Co., Louisville, Ky., Chairman of the Board of Directors of the Institute; Dr. Pierre Andre Rinfret, a distinguished economist, who is vice president and director of economics division, Lionel D. Edie & Company, Inc., New York, on "Economics of Tomorrow"; followed by Secretary of Agriculture Freeman. Other features of the program Monday morning will be the presentation of Distinguished Service Citations to past presidents and past chairmen of the board of the Institute and the Organization's annual business meeting.

The program on Tuesday, June 13 will feature addresses by W. M. Fifield, provost for agriculture, University of Florida, Gainesville, who will speak on the subject of "Coming Developments in Farming"; Henry L. Ahlgren, associate director, Extension Service, University of Wisconsin, at Madison, who will speak on the "Future Role of Agricultural Extension"; and J. E. Streetman, vice president and director of marketing, Ralston Purina Co., St. Louis, Mo. Scrolls will be presented to the winners in the "Soil Management Award for Editors" contest on Tuesday.

Paul T. Truitt, president of the Institute, will preside at both program sessions.

Meetings of the Board of Directors will be held Sunday evening, June 11 and on Wednesday morning, June 14.

Committee chairmen for the 1961 convention are: Mrs. Gene Van Deren of Cynthiana, Ky., Bridge and Canasta Party Committee; Mrs. J. Fred Corkill of Los Angeles, Calif., Ladies' Golf and Putting Committee; W. R. Morgan of New York, Men's Golf Committee; Tracy L. Adcock of Chicago, Horseshoe Pitching Contest Committee; Mr. and Mrs. W. B. Copeland of Little Rock, Ark., Hospitality Committee; Mrs. John W. Hall of Denver, Colo., Ladies' Committee; L. Dudley George of Richmond, Va., Memorial Committee; and Dr. Richard B. Bahme of San Francisco, Tennis Committee.★★

Orville L. Freeman
Secretary of Agriculture

Paul T. Truitt
President of NPFI

Unusual Promise Seen

CARBAMATE INSECTICIDES

A number of the aryl N-methylcarbamate compounds show unusual promise as insecticides relatively safe for the applicator, free from the chronic toxicity problems of storage in animal fats, and with unusually selective insecticidal activity.

One of the interesting features of this group of compounds is the synergism produced by combinations with the methylenedioxyphenyl synergists. These materials can synergize the action of Sevin, for instance, as much as 30 times against house flies.

by Robert L. Metcalf
University of California, Riverside

THE successful development of Sevin (1-naphthyl *N*-methylcarbamate) as a commerical insecticide has highlighted the potential importance of the aryl *N*-methylcarbamates for insect control, and thousands of related compounds are currently being synthesized and evaluated in at least a dozen research laboratories in various parts of the world. A number of them, to be described later, show unusual promise as insecticides relatively safe for the applicator, free from the chronic toxicity problems of storage in animal fats, and with unusually selective insecticidal action.

These carbamate insecticides are all synthetic derivatives of the alkaloid physostigmine or eserine found in the Calabar or ordeal bean, *Physostigma venenosum* of French West Africa. This bean has been used for centuries by the natives as a trial or truth drug. The alkaloid physostigmine was isolated from this plant in 1864 and its structure was described by Barger and Stedman in 1923. This material, because of its pronounced cholinergic action, has been used for many years in the treatment of the human diseases glaucoma and myasthenia gravis. The first important synthetic study in this field was the classical work of Stedman (1926) who synthesized the isomeric dimethylaminophenyl *N*-methylcarbamates, investigated the pharmacological properties of their hydrochlorides and quaternary ammonium salts, and subsequently produced the drug prostigmine or *m*-dimethylaminophenyl *N,N*-dimethylcarbamate methiodide, which is used similarly to physostigmine. A great volume of synthetic work has been done in this field leading to the production of many other highly effective anticholinergic substances for pharmacological use. However, all of these compounds contained the quaternary ammonium grouping which we now know is unable to penetrate through the insect lipoid nerve sheath, and proved to be inactive as insecticides.

Gysin (1954) described the strong insecticidal properties of the related *N,N*-dimethyl carbamates of a variety of heterocyclic enols and several of these compounds, especially Pyrolan, Isolan, and Dimetalan, have been used commercially as insecticides especially for fly and aphid control. Kolbezen, Metcalf and Fukuto (1954) first called attention to the importance of the insulating properties of the insect nerve sheath in the insecticidal action of these carbamates and showed that although highly charged molecules such as prostigmine were inactive, spatially similar uncharged molecules such as *o*- and *m*-dimethylamino, methyl-, ethyl-, isopropyl-, and *tert*-butylphenyl *N*-methylcarbamates had considerable insecticidal action.

The development of Sevin[1]/, first described by Haynes, Lambrech and Moorefield (1957) proved that insecticides of this class were potentially safe, inexpensive, stable, and of relatively broad spectrum effectiveness. The production and use of Sevin in multimillion-pound quantities by the Union Carbide Chemicals Corporation is an exciting success story. Sevin is a white crystalline compound, m.p. 142° C., relatively insoluble in water (about 0.1%) and somewhat soluble in organic solvents. It is relatively non-toxic to mammals, having an oral LD_{50} to the rat of 540 mg. per kg. and a dermal LD_{50} to this animal of in excess of 5,000 mg. per kg. Equally important to its successful use as an insecticide is its rapid hydrolysis in the mammalian digestive tract to form 1-naphthol which is detoxified by formation of water soluble conjugates such as 1-naphthyl glucuronate and largely eliminated from the body in the urine. Careful studies such as those of Gyrisco *et al.* (1960) have shown that Sevin fed to dairy cows at 450 p.p.m. is not absorbed and deposited in animal fat and that neither Sevin nor its detoxication products are found in the milk. Therefore, Sevin may be used to treat a variety of animal forage products where the chlorinated hydrocarbons cannot be used, e.g. for the control of the corn earworm where the husks are used as cattle feed. Extensive field investigations with Sevin have uncovered an increasing number of uses and it is now widely recommended by state and federal authorities for the control of such insects as leafhoppers, thrips, scale insects, plant bugs, Mexican bean beetle, codling moth, apple maggot, red banded leafroller, pear psylla, Japanese beetle, oriental fruit moth, periodical cicada, corn earworm, cotton boll weevil, pink bollworm, cotton leafworms and bollworms, cotton fleahopper, and cotton leaf perforator. It is generally applied at 0.5 to 2 lbs per A. and is registered on more than 27 crops with residue tolerances ranging from 5 to 10 p.p.m. A tolerance of 25 p.p.m. is given for corn fodder and cannery waste. The principal limitations in its use are its considerable degree of specificity and especially its lack of acaricidal action, its high toxicity to bees, and its moderate solubility in suitable organic solvents which has limited its use in emulsifiable formulations.

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[1]/ Trademark, Union Carbide Chemicals Corporation.

Other newer carbamate insecticides are undergoing extensive field trials. Like Sevin, they are white, crystalline materials virtually insoluble in water. *Meta*-isopropylphenyl *N*-methylcarbamate has been used experimentally under the codes Hercules AC5727 and Union Carbide UC 10,854. It is extremely effective against a considerable variety of lepidopterous larvae, is active against a variety of other insects including cockroaches, bugs, beetles, and aphids, and has some acaricidal activity. A most surprising feature is its activity against adult mosquitoes, where it outperformed DDT, dieldrin, and malathion. Residues as low as 1 mg. per sq. ft. produced rapid knockdown and kill of *Anopheles* for periods of more than 5 months (Gahan, LaBrecque, and Wilson 1961). It is also a good mosquito larvicide, but is not highly active against house flies. This compound has been shown by David, Metcalf and Winton (1960) to have effective systemic properties against lepidopterous larvae. Its principal disadvantage is its higher mammalian toxicity (oral LD_{50} to the rat, variously given as 16 to 60 mg. per kg.). In this regard, the isomer *o*-isopropyl-phenyl *N*-methylcarbamate, although generally somewhat less effective against insects, has a much lower mammalian toxicity (oral LD_{50} to the rabbit of about 300 mg. per kg.) and is potentially a useful insecticide. The closely related *m*-sec-butylphenyl *N*-methylcarbamate developed as Cali-

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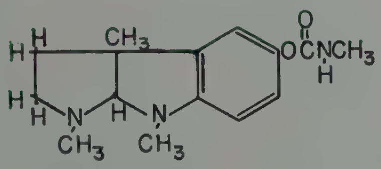
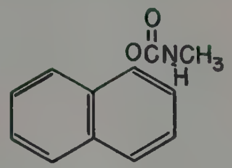
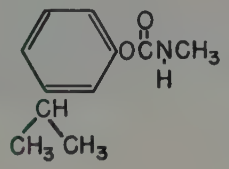


physostigmine



Sevin



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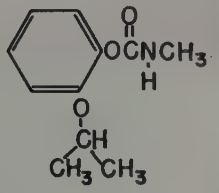

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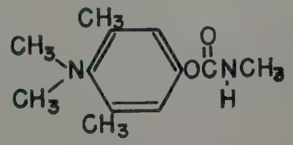
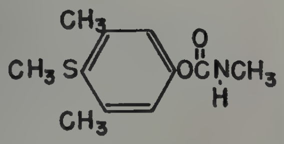


Zectran



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Armour Construction Begins

Six different manufacturing plants are being constructed for Armour on a 1,200-acre tract. They will use common sources of power, water, and natural gas. Tons-a-day capacities will be ammonia, 260; urea, 50; nitrogen solutions, 150; nitric acid, 300; ammonium nitrate, 250; and ammonium phosphate, 500. Completion is scheduled for the first quarter of 1962.

CONSTRUCTION of a huge nitrogen fertilizer manufacturing complex was started officially April 25 in Cherokee, Alabama, for Armour Agricultural Chemical Co., Atlanta, Ga. The plant is part of a $60,000,000 expansion program currently being undertaken by Armour.

Shown turning the first shovel-full of dirt are: from the left, E. W. Wilson, president of Armour & Co.; Governor John Patterson of Alabama; and William Wood Prince, Armour chairman of the board.

The Cherokee complex will consist of six different manufacturing plants on the one 1,200-acre site, using common sources of power, water, and natural gas. Tons-a-day capacities of the six plants will be ammonia, 260; urea, 50; nitrogen solutions, 250; nitric acid, 300; ammonium nitrate, 250; and ammonium phosphate, 500.

The official ground-breaking ceremonies for the plant were attended by Alabama's Governor John Patterson, who said that the plant will "add substantially to the prosperity of Cherokee and of Colbert County." The plant is located on a 1,200-acre tract at Cherokee, in the northwestern part of the state, about 15 miles from the point where the corners of Alabama and Mississippi touch the southern edge of Tennessee. The site is on Pickwick Lake which was formed in the Tennessee River by TVA's Pickwick Landing Dam. The complex will occupy a fenced area of approximately 100 acres. Two miles of new roadway and three miles of railroad trackage are on the site and the Southern Railway will build a four-mile spur from Cherokee to the site. In addition the Tennessee Valley Authority will build a substation on the grounds.

M. W. Kellogg Co., New York, a subsidiary of Pullman, Inc., is engineering manager and will act as coordinators for the entire project. Kellogg also will engineer, procure materials for, and construct the ammonia and urea plants, as well as be responsible for construction of all off-site facilities. The Chemical & Industrial Corp., Cincinnati, has the contract for engineering - procurement - construction of the nitric acid, nitrogen solutions, and ammonium nitrate plants, while Chemical Construction Corp., New York, will handle the work for construction of the ammonium phosphate plant. Completion is scheduled for the first quarter of 1962.

E. W. Wilson, president of Armour and Co., Chicago, said, at the ground-breaking ceremonies, that the new Cherokee facility is a "significant part" of Armour's continuing program of growth. In addition to the Cherokee plant, the program will include construction of a phosphate plant near Fort Meade in Polk County, Florida, and an extensive modernization program for existing fertilizer mixing plants. There are 34 of these plants located in the United States and Puerto Rico.

When Armour's current $60,000,000 expansion program is com-

(*Continued on Page* 108)

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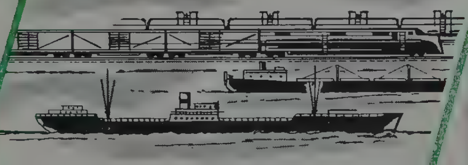

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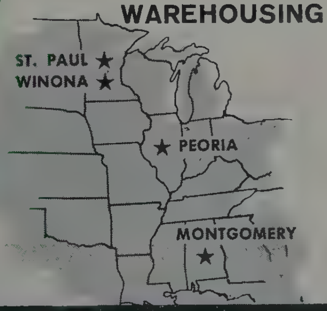

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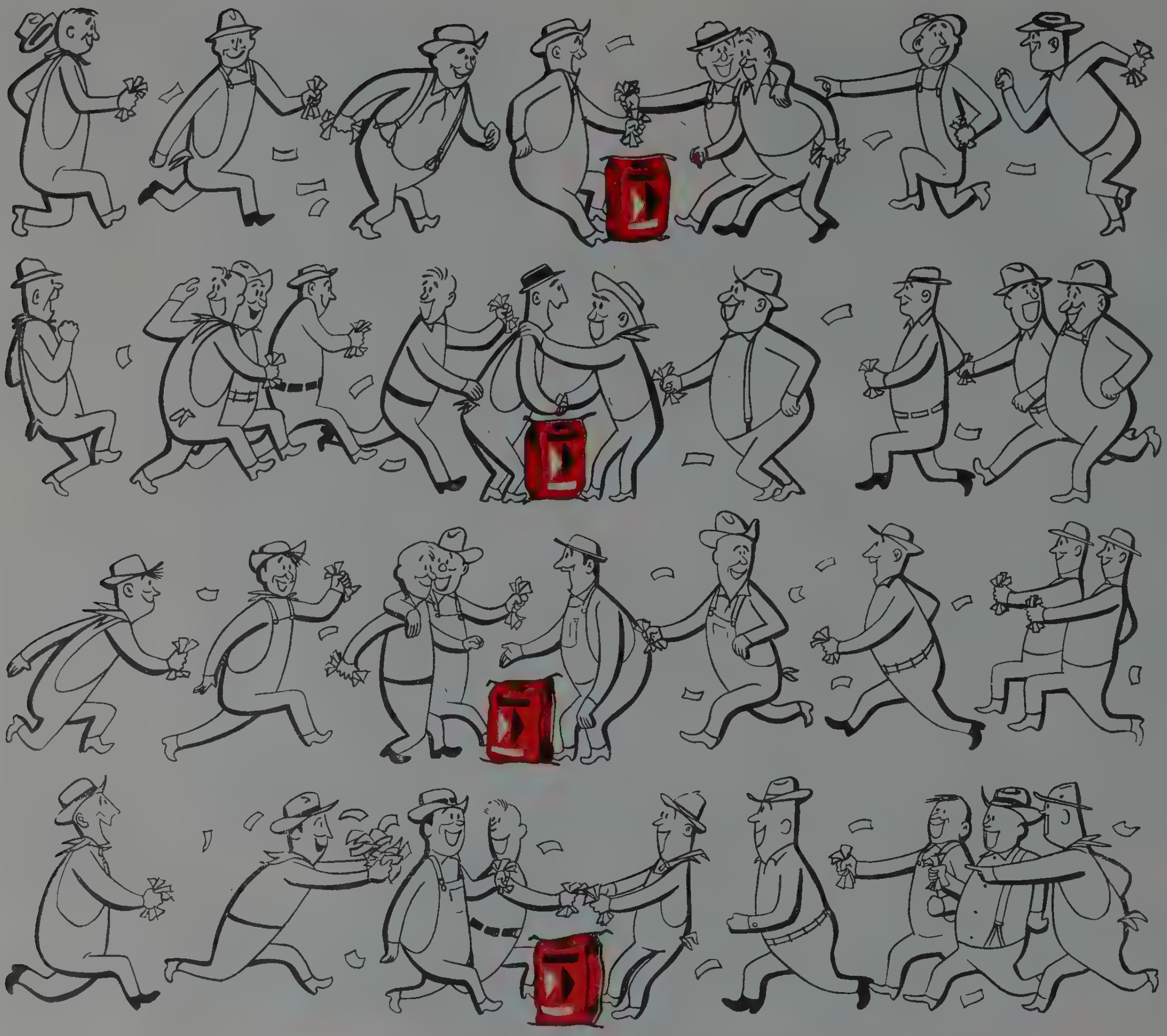

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Knowing Capabilities Of Multiwalls Helps Avoid Problems In Handling

Paper bags are manufactured under conditions which give them the necessary moisture content at time of shipment. During shipment, however, they may lose some of the moisture due to low relative humidity caused by drafts of dry air into the rail cars, extreme dry heat, extreme cold, or a combination of these.

Torture testing and other forms of research have proved that multiwall bags are capable of absorbing more punishment than they should receive. And the thrifty packer will see to it that his multiwalls are not pushed beyond their limits by chemical reactions within the product or by careless handling.

SOME of the problems occasionally encountered when packing fertilizer in multiwall paper shipping sacks could be avoided if, first of all, the packer became more familiar with the capabilities of the container and, secondly, followed the fundamental rules for handling multiwalls.

To many packers, these facts are self-evident. Others, however, have experienced needless difficulties because they either failed to take into account the interrelationship of product and package, or did not enforce the basic rules of multiwall handling. Of course, disregarding these two points will not necessarily mean a sudden breakdown in packing and shipping since the multiwall bag is a very serviceable container. More likely, the little, seemingly insignificant infractions of good handling procedures will show up in isolated instances of bag failures—a ripped bag here, a closure break there—and weave separate courses to the overhead column. Compounded, however, these "insignificant" infractions can become quite expensive.

Chemical Changes

In some cases, failure to make packaging compensations for changes in the characteristics of the fertilizer being packed can jeopardize whole shipments. This was

Methods of maintaining proper moisture content in stored multiwalls range from simple floor-wetting (right) to rather elaborate methods like the steam valve (left). In any event, a humidity indicator should be placed in the storage room for frequent checks. Rags draped over the side of an open water barrel and open windows on rainy days also help.

Changes in the characteristics of material being packed can jeopardize whole shipments.

On pallets, the filled bags should be stacked flat and even with the edges.

When two men are lifting a bag, they should place their hands underneath it.

A bag should be carried flat on the shoulder with the edge resting against the body.

aptly demonstrated during a recent investigation conducted by the Trade Extension Unit of Bemis Bro. Bag Company.

The investigators found that multiwall bag failures after packing certain fertilizers could be traced to the deterioration of bag structure caused by excessive free acid.

In one instance, investigators found that triple superphosphate had been packed "green" without compensation in packaging. Since triple superphosphate's free acid depends on the amount of curing, the packer normally stored it in curing bins for at least four weeks. However, the curing bins were depleted during the peak season and the "green" phosphate, containing a greater than normal amount of free acid, caused deterioration of the cellulose bag structures shortly after packing. One packer averted the same problem by substituting heavy-mil polyethylene bags for his regular multiwalls when packing "green" phosphate.

Another type of fertilizer has caused similar packaging problems. This is the fertilizer of incomplete analysis containing no nitrogen, such as 0-20-20, made by mixing superphosphate and potash. Sulfuric acid, which may contain impurities, often is added to the superphosphate to convert a greater percentage of the phosphate to available P_2O_5. Then, the addition of muriate of potash introduces still another acidic source from the chlorine in this compound. Its combination with the free acid produces hydrochloric acid which, added to excess sulfuric acid, presents a dual threat to bag structures.

Again, plastic can be used to avert bag failure from this source. In this particular case, a 15-lb. polyethylene coating on kraft paper has proved effective. Acid-resistant thread, such as Bemis Golden-Ply, should, of course, be used for sewing, and long storage of filled bags should be avoided.

Empty Bag Storage

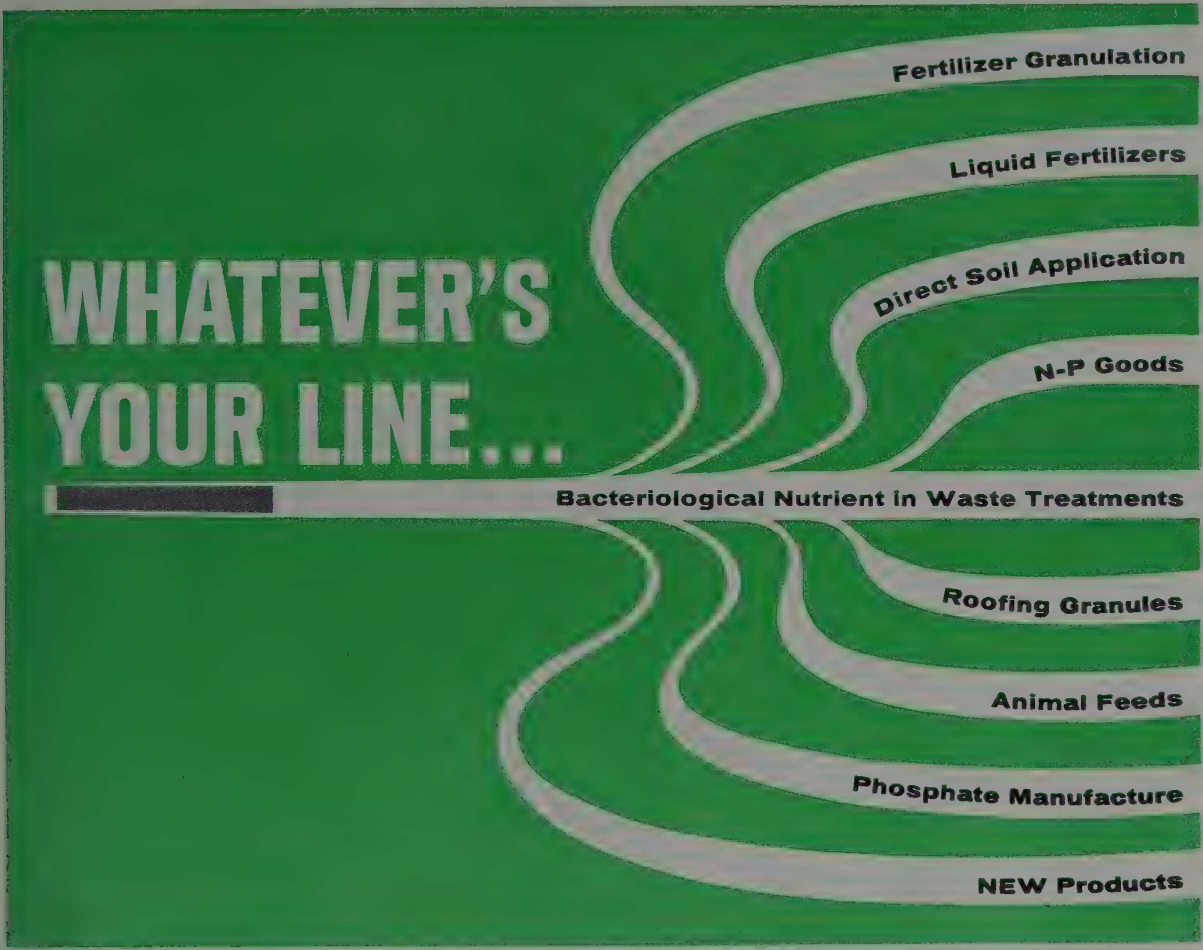
Multiwall paper bags are strongest and perform best when the moisture content of the paper is about 6 or 7 per cent. If the moisture in the paper is allowed to drop below normal, the bags will become weakened and brittle. This condition can lead to expensive breakage in handling and shipping.

Paper bags are manufactured under conditions which give them the necessary moisture content at time of shipment. During shipment, however, they may lose some of the moisture due to low relative humidity caused by drafts of dry air into the rail cars, extreme dry heat, extreme cold, or a combination of these and other shipping conditions. Improper storage conditions, too, often are responsible for robbing bags of the moisture necessary to give them maximum strength.

After some experience with paper bags, it is not difficult to tell when they have become too dry. One simple way is to test the bags for "rattle." Shake the bags briskly. If the bags "rattle" sharply, they are too dry for best performance and should be reconditioned before using.

Reconditioning can best be accomplished by storing the bags in properly humidified storage rooms so they may regain their normal moisture content. Paper bags which are in good condition should be similarly stored to maintain them at the proper moisture level.

Dried-out bags are one of the most common causes of trouble, and one easily avoided. Ideal storage conditions for keeping the proper 6 or 7 per cent of moisture in the paper call for a relative humid-



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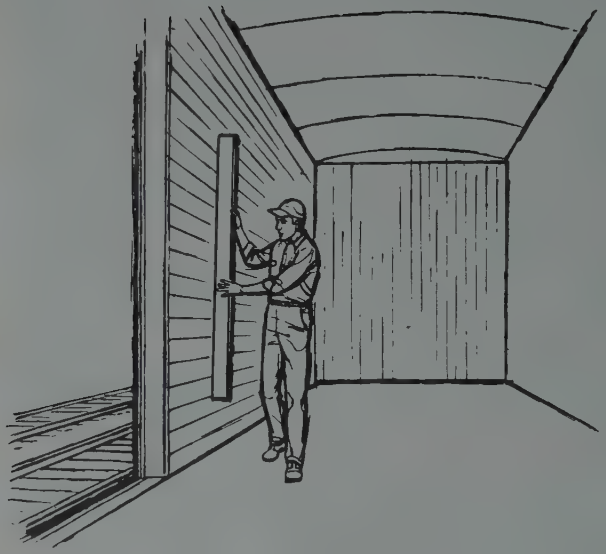

In preparation for loading filled multiwall bags on a railroad car, the walls of the car should be searched for protruding nails by drawing a board along the walls. Protrusions that cannot be removed should be covered with cardboard or car liner paper, and loose boards should be made tight.

ity of about 50 per cent at warm temperatures.

Handling Filled Multiwalls

Manual handling procedures, of course, should be designed to protect the workmen as well as the filled bags. If one man is lifting the bag, he should do so with his hands underneath it, preferably at diagonal corners. When two men are lifting a bag, they also should place their hands underneath it, supporting the four corners. A bag should be carried flat on the shoulder with the edge resting against the body.

On the negative side of manual handling methods, bags should not be gripped nor pulled by the corners. In the case of a gusseted bag, it never should be lifted or dragged by fingers inserted in the gussets underneath the sewn ends or in value openings. And, obviously, bags should not be dragged across the floor.

Hand trucks, chutes, and conveyers should be inspected to make sure there are no protruding nails or splinters. Old burlap, or a similar protective material, can be used to cover protruding edges that cannot be removed. Hand trucks should have wide, extended lips since narrow-blade lips can cut into the bag. Extensions can be added to trucks with narrow-blade lips. Bags should be placed flat on the hand truck—never by pushing the blade under the bottom of a stack.

Wooden pallets may be used and, indeed, are becoming quite popular. On pallets, the filled bags should be stacked flat and even with the edges, with the end sacks interlocked.

Railway Car, Truck Loading

Adequate preparation of railway cars and trucks will curb much in-transit damage to multiwalls. Cars should be clean, dry, and free from protruding nails or other projections. They should have sound roofs, tight-fitting doors, and smooth floors, and walls. Dust and dirt should be swept from the walls, floors and ceiling, and pieces of crushed rock, grain and grit under the side boards should be removed. This residue from other types of shipments has a tendency to work out underneath the load and may slit a bag as cleanly as a razor blade would.

Loose nails, of course, should be removed. A straight-edge board about five feet long is useful in locating protruding nails when drawn along the car walls in a perpendicular position. In addition, loose boards in the walls and floor should be made tight, and protrusions that cannot be removed should be covered with cardboard or several sheets of liner paper.

Car liner paper is invaluable for covering walls and floors, especially if the car is in poor condition and is to be fully loaded, but this paper is hardly strong enough to properly cover storm doors. Here retaining strips should be used. These strips, designed to hold the bags away from the storm doors, prevent damage caused by slippage into the doorway and also allow the load to be easily inspected. Cars should be loaded by a pattern to minimize shifting during transit. There are, in general, four methods of loading—crosswise, brickwall, lengthwise and by key sacks. The latter method, developed by Bemis Bro. Bag Company, is based on the use of a row of "key sacks" to literally lock the load in place. This method can be used in combination with one of the other methods to lock the load just by the doorways or it can be used for the entire load.

Truck beds also should be free from dirt, debris, and protrusions. If long hauls are involved, or if the truck bed is in poor condition, car liner paper should be used. The best method of loading bags in open, stake-side, and enclosed trucks is flat, with ends parallel to the sides of the truck. Naturally, tarpaulins should be used to protect the bags from rain and other poor weather conditions.

Reliable Container

Multiwalls can take abuse, as practically any fertilizer packer can attest. The overwhelming acceptance of multiwalls for packing fertilizer is, in itself, testimony to the containers' reliability. This is, of course, no accident. Torture testing and other forms of research have proved that multiwalls are capable of absorbing more punishment than they should receive.

The thrifty packer will see to it that the container is not pushed beyond its limits by chemical reactions within the product or by careless handling. And for his precautions, he will receive even better service and even more economy from his multiwalls.★★

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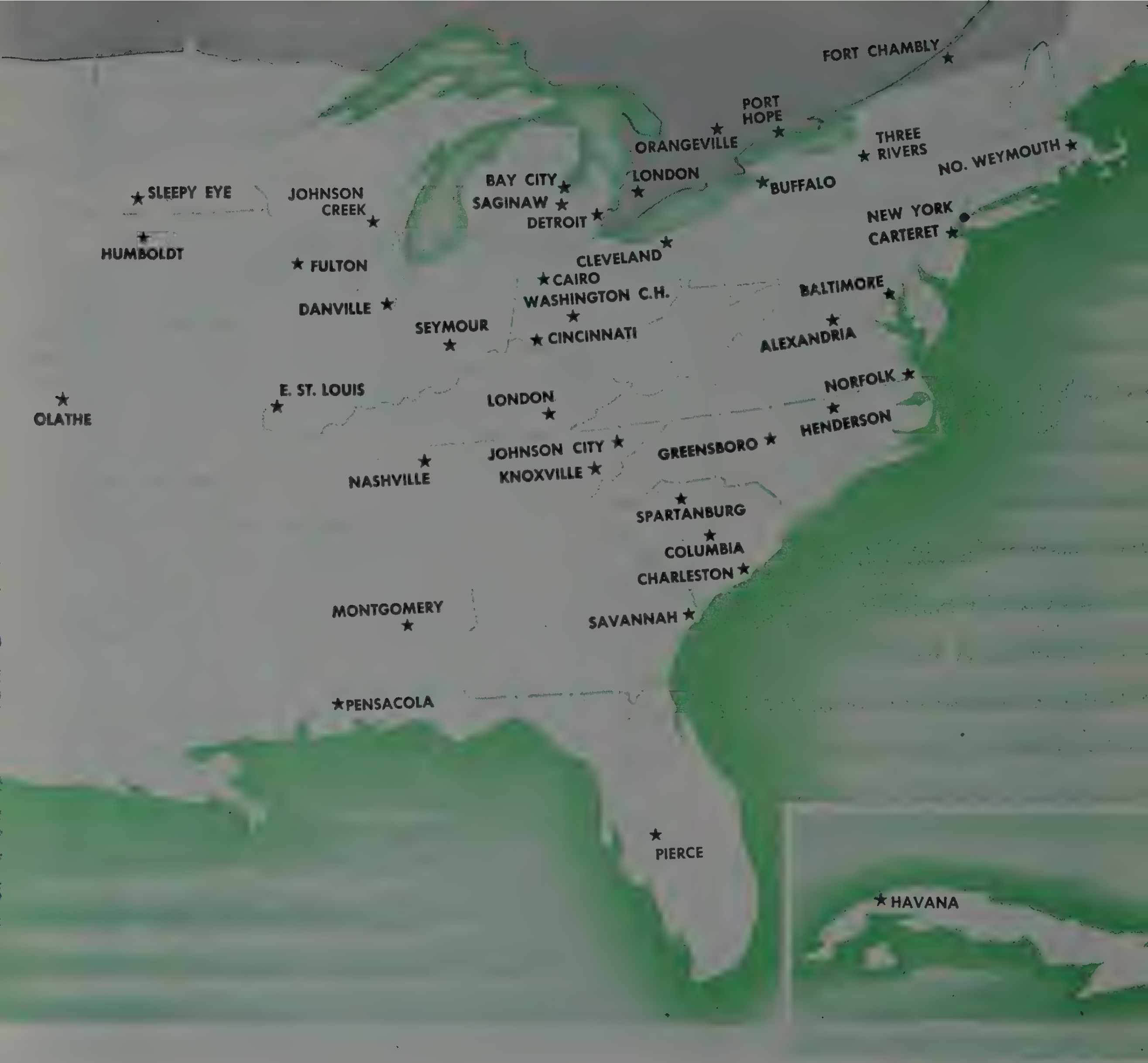

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Financing And Advice By Dealers Influence Farmers' Fertilizer Use

South Carolina fertilizers dealers are experienced business men. Only four per cent have been in business less than ten years. More than one-half have been in business 30 years or more and 13 per cent have been fertilizer dealers for 50 or more years. Fertilizer is the major product line of 25 per cent of the dealers, who account for about 40 per cent of the total fertilizer sales.

Five per cent of dealers feel that the mark-up they charge is "adequate." Another 29 per cent feel that it is "barely adequate," and 35 per cent feel that their mark-up is "inadequate." (This latter group handles 44 per cent of the total volume of fertilizer.) Another 12 per cent of the dealers indicate merely that they are able to "break even" with the mark-up they charge.

THE results of a survey of fertilizer dealers throughout South Carolina indicate that these men play an important role in financing fertilizer purchases and in the farmer's decision-making process regarding fertilizer use. The survey was conducted by D. E. Crawford, associate agricultural economist, Department of Agricultural Economics, Clemson Agricultural College, Clemson, S. C. The results were compiled from answers to detailed questionnaires that were mailed to all fertilizer dealers in the state. Approximately 20 per cent of the dealers responded.

South Carolina fertilizer dealers are experienced business men. In response to the question "How long have you been a fertilizer dealer?", only 4 per cent of the dealers reported that they have been in business less than ten years. More than one-half have been in business 30 years or more and 13 per cent have been fertilizer dealers for 50 years or more. The average length of service in the business for all dealers is slightly in excess of 25 years.

Forty-six per cent of the dealerships are owned by individuals. Twenty-five per cent are partnerships, 25 per cent are corporations, and the remaining four per cent are cooperatives. On the basis of number of years in business, cooperatives were the youngest, with an average length of service of 10 years.

Fertilizer is the major product line of 25 per cent of the dealers who responded to the questionnaire. These dealers account for about 40 per cent of the total fertilizer sales, and their average length of service is 30 years. The dealers in this group, therefore, are larger than average and have been in business longer than average. The second major product line of these South Carolina dealers is farm supplies, followed by general merchandising. The average length of fertilizer dealerships is 30 and 31 years, respectively, for business in these groups. Cotton, feed, and coal, all are important items in the total business done by fertilizer dealers operating in South Carolina.

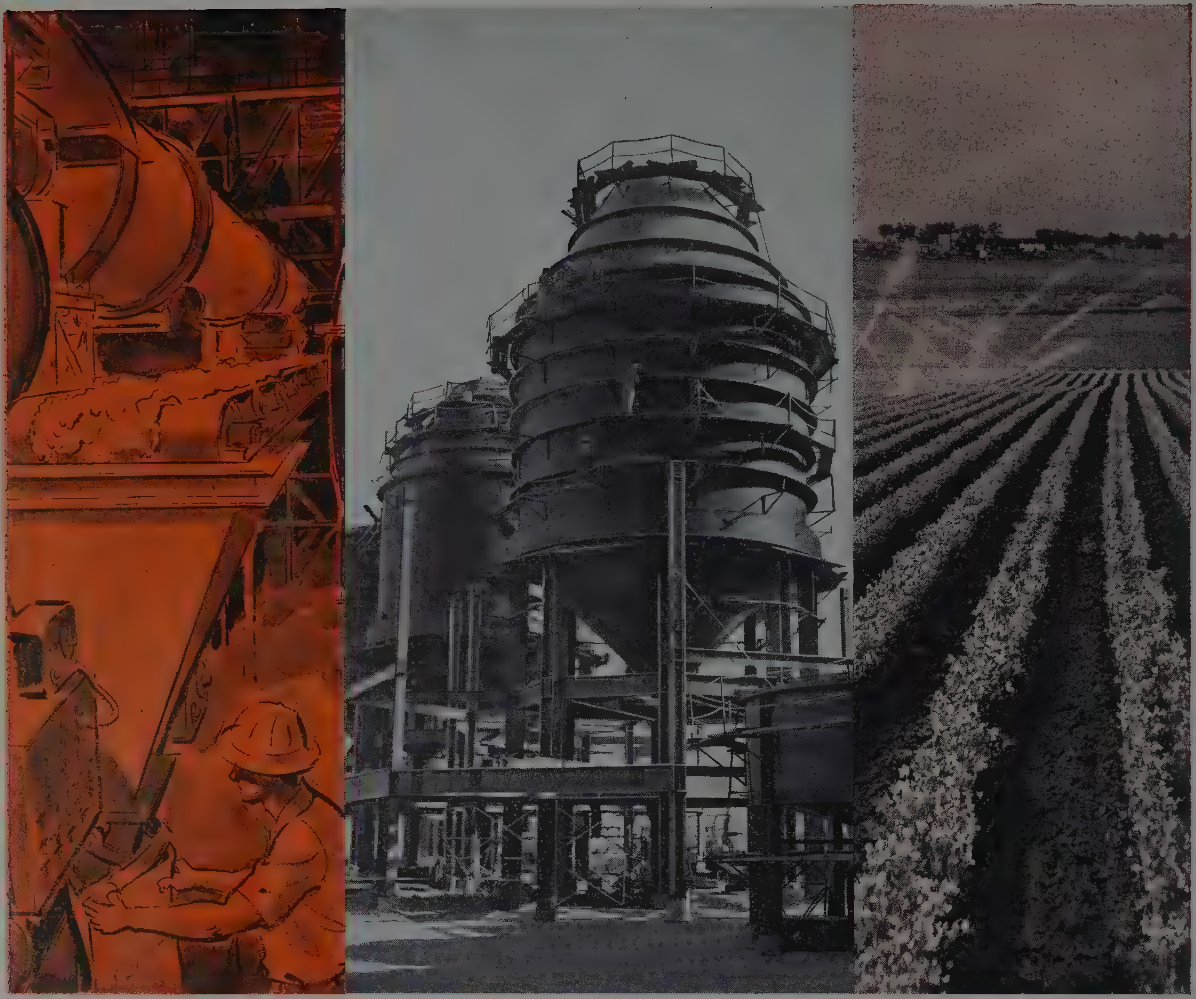
On the basis of number of years in the fertilizer business, those dealers whose leading sales item is feed are the youngest, with an average length of service of 19 years.

Among those dealers responding to the Clemson questionnaire, fertilizer sales volume ranges from $1,000 to $480,000 per year. One-third, however, sell less than $10,000 worth of fertilizer, and two-thirds sell less than $31,000 worth each. Actually, one-fourth of the dealers sold three-fourth of the fertilizer during the year ended June 30, 1960. On the average, fertilizer sales make up approximately 25 per cent of the total volume of all sales by these dealers.

The number of farmer customers who purchase fertilizer from any one dealer ranges from 9 to 1,500, with an average of over 200 customers per dealer. The average quantity of fertilizer purchased by each customer is approximately six tons.

Profit Margins

The gross margin of profit (mark-up from purchase price) re-



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Other Sales Offices: Chicago • San Francisco • Portland (Ore.) • Atlanta • Columbus (O.) • Shreveport ported by all dealers varies from one to 15 per cent for cash sales and from two to 50 per cent for credit sales. The average mark-up reported for cash sales is 7.69 per cent, and for credit sales 13,63 per cent. (These averages do not include a few dealers who reported charges which represented the cash price *plus* ten per cent *plus* an interest charge *times* the number of months credit was extended.)

Fifty-eight per cent of the dealers report that they realize less than ten per cent gross profit margins on cash sales. Twenty-nine per cent report ten per cent, and the remaining 13 per cent report more than ten per cent. Gross profit margins from credit sales are slightly higher than those realized on cash sales, with only 25 per cent of the dealers reporting that they charge less than ten per cent markup. Twenty per cent charge an even ten per cent, and the remaining 55 per cent charge more than ten per cent.

When asked about their markup charges, only five per cent of the dealers replied that the mark-up they charge is "adequate." Another 29 per cent feel that it is "barely adequate," and 35 per cent feel that the mark-up they charge is "inadequate." These dealers handle 44 per cent of the total volume of fertilizer. Another 12 per cent indicate merely that they are able to "break even" with the mark-up they charge.

As previously indicated, a great majority of the fertilizer dealers included in the survey are engaged in the handling of many and varied product lines in addition to fertilizers. Among other things, the dealers were asked to evaluate the role of their fertilizer operation in their overall plant.

3 per cent of the respondents said their fertilizer division is "a good money-maker in itself."

25 per cent indicate that it provides an important customer service.

34 per cent are of the opinion that it is essential for them to maintain their fertilizer department in order for them to compete with other businesses.

50 per cent state that it is an integral part of their business organization.

46 per cent say that they have been "in business so long it's hard to give up."

(The sum of these percentages exceeds 100 since many dealers reported more than one answer.)

More than half of the dealers responding to the Clemson questionnaire voiced considerable pessimism regarding their future in the business. Twenty per cent of the fertilizer volume, however, was sold by the 14 per cent of the dealers who classify business as "good" and "very good."

Eight per cent of the fertilizer dealers characterized their business as "hopeless" and 45 per cent said it is "poor." Thus, more than half of the dealers responding to the questionnaire voiced considerable pessimism regarding their future in the business. However, 33 per cent of them indicated that the fertilizer business was "average"; 8 per cent evaluated their business as "good"; and 6 per cent as "very good." Twenty per cent of the fertilizer volume was sold by the 14 per cent of dealers classifying business as "good" and "very good."

As a general rule, dealers who have been in business a shorter length of time reveal a more optimistic view of business conditions. For example, those who characterized their business as "very good" have been dealers for an average of 17 years, while those saying business was "terrible" have been selling fertilizer for an average of 34 years.

Services Performed

A fertilizer dealer performs many services other than "just a supplier of needed goods and services.'" As a matter of fact, South Carolina dealers are revealed to be engaged in a variety of public services ranging from educational programs for public meetings to test plot demonstrations and direct technical assistance to individual growers.

77 per cent of the dealers recommend the grades and analysis of fertilizer for various crops and pasture.

63 per cent recommend rates of application and placement of fertilizer.

32 per cent distribute published information on the subject.

20 per cent sponsor soils testing programs.

14 per cent sponsor test plots and pasture demonstrations.

14 per cent make available experienced personnel to assist farmers with their fertilizer problems.

5 per cent sponsor educational programs over radio, television, and at public meetings.

One can readily see, therefore, that a majority of the fertilizer dealers in South Carolina are doing more than just selling a physical product.

Principal "Gripes"

Fertilizer dealers were asked to rank in order of importance their principal "gripes," as regards the fertilizer business. The number one "gripe" for a majority of dealers was price cutting by other dealers. The second most important complaint was that "the company by-passes me and sells direct to my customer." The answer ranking third in importance from the dealer's viewpoint was "difficulty in collecting credit sales." This was

(*Continued on Page* 103)

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Common Control Measures Unsuccessful With Face Flies

Large-scale tests involving a whole host of the organophosphate and chlorinated hydrocarbon insecticides normally used as residual treatments proved ineffective when applied to barn and shed walls and fences. Also discussed are insecticide marketing and pest control in Russia.

by Donald A. Davis

THE face fly (*Musca autumnalis*) cannot be wholly or even practically controlled by any of the common practices currently recommended for the control of flies on cattle, declared Dr. George C. Decker, of the Illinois Natural History Survey, Urbana, Ill., in a paper delivered before the Insecticide Division of the Chemical Specialties Manufacturers Association meeting, May 17 in Chicago. Dr. Decker indicated that this peculiarity of the species is due to the fact that the face fly seems "to combine into one species most of the more baffling characteristics of the other muscoid flies (house fly, stable fly, and horn fly).

"When no one control measure proved highly effective," he pointed out, "research workers in the various states selected that practice which, under their local conditions, appeared to show the greatest promise and directed their efforts toward the further perfection of that particular practice. In all fairness, it must be said that most of them included in their studies at least some tests involving materials and methods being advocated by their associates in other states. However, all too often they inadvertently omitted one or more of the essential details prescribed by the principal advocate of the practice and therefore failed to get comparable results. Thus, it is not surprising that none of the procedures proposed has universal acceptance — all of which reminds us that very often it is not so much what we do but how well we do it that counts.

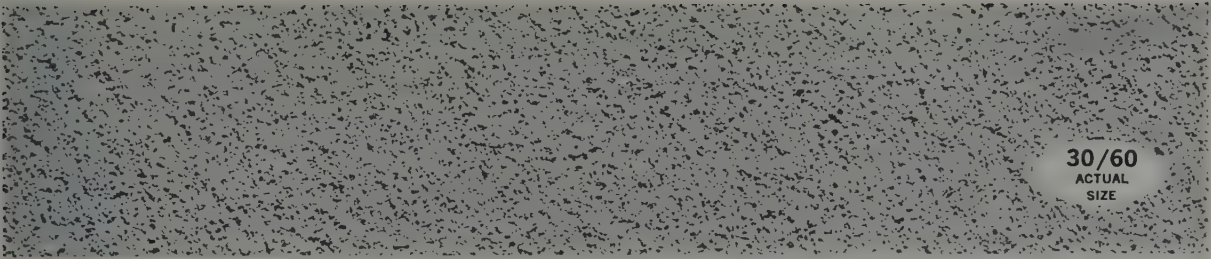
"In the laboratory, topical application and panel type cage tests seem to show that the face fly is about as susceptible to most of the commonly used insecticides as normal house flies. However, large-scale tests involving a whole host of the organophosphate and chlorinated hydrocarbon insecticides normally used as residual treatments proved wholly ineffective when applied to barn and shed walls, fences, etc.

"Livestock sprays or dusts containing such residual toxicants as DDT, chlordane, toxaphene, malathion, ronnel or Co-Ral gave only temporary relief at best, and were soon abandoned by all investigators. Since the flies do not appear to possess resistance or any high degree of tolerance to these chemicals, it is difficult to say just why they were not more effective. Of course, these flies spend much time off the animals and breeding occurs largely out in the open pasture areas, which makes it possible for them to maintain disturbing populations despite a high mortality among those flies that come in contact with the insecticides. Then, too, it is always possible that since this type of treatment has not been popular in recent years, its potential has not been fully exploited. The residual life or period of effectiveness of such treatments was never long enough to greatly interest beef producers and when such sprays containing DDT and related materials were banned for use on dairy cattle, they were almost universally abandoned."

Dr. Decker also reported "variable" results with the residual toxicants and some repellents applied by "back-rubbers," pointing out that such devices do have some use in controlling flies on beef cattle. He reported that 5% solutions of DDT, toxaphene, or methoxychlor in mineral oil seem to give about equally good results and under highly favorable conditions of use will maintain 75 to 80% control of the face fly. He emphasized that design, installation, and acceptance of the backrubber unit seem to be "more critical" than the choice of toxicant. However, he cautioned, beef animals using the rubber should not be marketed or slaughtered within 30 days of their last use of the device.

Application of syrup baits to the faces of cattle, he reported, has been the most successful way of controlling the face fly in Illinois. The simplest and most effective bait, he said, contained 75% corn syrup, 25% water, and 0.1% DDVP (O,O-dimethyl 2,2-dichlorovinyl phosphate). "Baits containing the water-soluble organophosphates DDVP and Dimethoate proved much more attractive than those

(*Continued on Page* 100).



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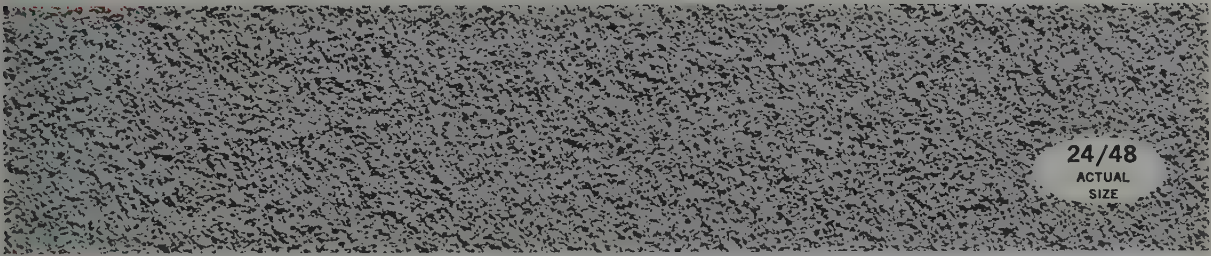

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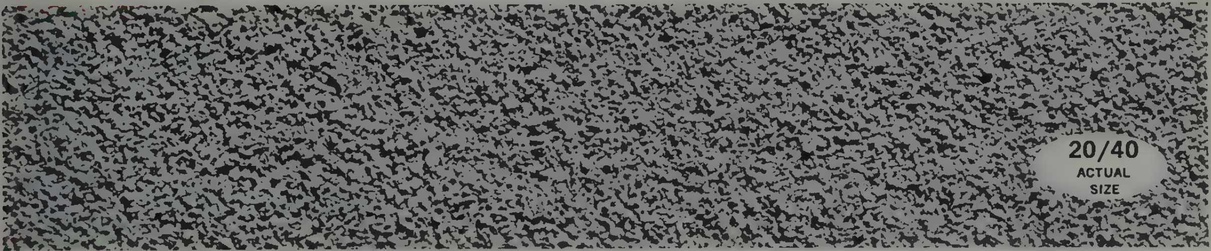

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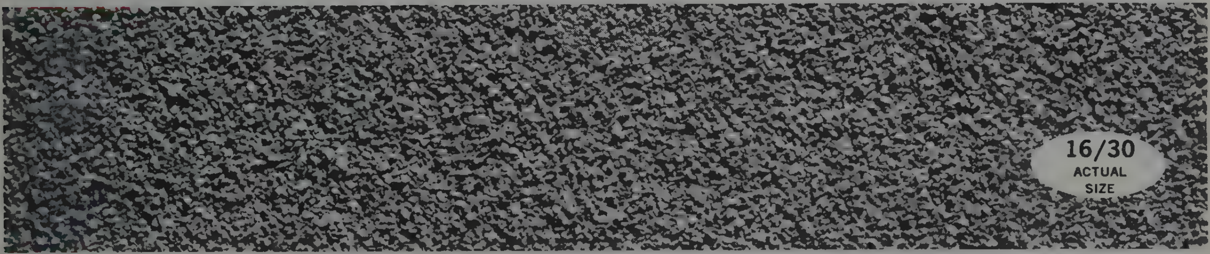

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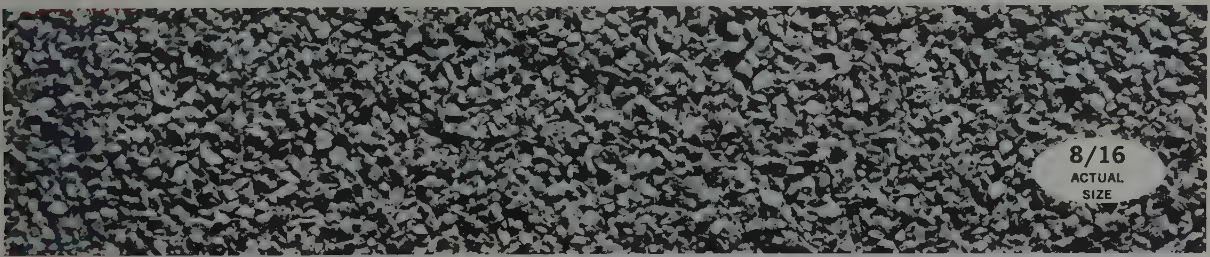

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Italian Fertilizer Producers Influence Rising National Economy

From 1955 through 1958, investments in the Italian chemical industry totaled $742 million, with an annual average of $185 million. The investments made in 1959, which have gone largely into new fertilizer plants, totaled $234 million. The expanding production of chemical fertilizers is a main feature of the growth of the chemical industry and the entire economy of Italy.

THE expansion of production of chemical fertilizers in Italy is one of the salient features of the growth of the Italian chemical industry, which for several years has been playing a major role in the progress of the entire Italian economic system. In 1959, the chemical industry was the third largest contributor to the formation of the Italian national product, with a production valued at $777,419,000—a very large figure, indeed, if one considers the continuing need for heavy depreciation allowances in connection with the large investments in new plants and facilities.

From 1955 through 1958, investments in the chemical industry totaled $742 million, with an annual average of $185 million. The investments made in 1959, which have gone largely into new fertilizer plants, totaled $234 million, according to figures presented in *Italy Presents*, an English language magazine distributed in the U. S.

The policy followed by the Italian chemical industry with respect to the production of fertilizers clearly is inspired by the basic criterion of building new facilities in the depressed areas of southern and insular Italy (Priolo and Porto Empedocle in Sicily, and Brindisi in Puglia, on the mainland) and of developing the most economical methods for the use of natural gas, both as a source of power and as a raw material.

Technological progress has been extremely fast. Since 1947, when the production indices were 70 for phosphatic fertilizers and 75 for nitrogenous fertilizers (taking 1938 = 100), tremendous improvements have been introduced, as regards phosphatic fertilizers, in the milling of phosphorites, and in the granulation of superphosphates, so as to offer to the domestic and international markets high phosphor-content superphosphates.

With regard to nitrogenous fertilizers, progress here has been even greater due to the large scale use of natural gas near the major gas fields, and to the utilization of urea.

The production of potassium fertilizers also has registered a considerable expansion due to the development of potash deposits in Sicily.

Over the last five years (1955 to 1959), the production of ammonium sulfate has risen from 151,456 to 239,079 metric tons of nitrogen, that of ammonium nitrate from 56,708 to 146,365 metric tons; while the production of calcium nitrate reached 45,268 tons in 1959, that of sodium nitrate 1,032 tons and that of calcium cyanamide rose to 26,233 tons in the same year.

In the field of phosphate fertilizers, the production of mineral superphosphates (in terms of sulfur dioxide) decreased from 382,194 to 338,143 metric tons, over the same five-year period; the production of bone superphosphate diminished from 4,428 to 1,841 metric tons.

As a result of the considerable increase in plant production capacity, Italian chemical fertilizers are being exported in increasing quantities to foreign markets. The principal outlets are the countries of Eastern Europe, the Middle East, and the Far East. Ammonium nitrate exports to Yugoslavia increased from 45,542 metric tons in 1955 to 81,280 metric tons in 1959; exports to Egypt increased from 10,701 to 96,825 metric tons in the same period. In the last few years, Bulgaria and Greece also have started importing Italian fertilizers. Ammonium sulfate exports to Greece, for example, increased from 45,396 tons in 1955 to 98,367 tons in 1959. Substantial quantities also have been exported to India, Pakistan, and Korea. The major market for Italian superphosphates is Austria, which took 65,761 tons in 1955 and 40,534 tons in 1959. Subsequently, other markets, such as Bulgaria, Yugoslavia, and Hungary, have assumed major importance.

The total value of Italian fertilizer exports has increased from $24 million in 1955 to $51.5 million in 1959.

Major Producers

Four concerns share the bulk of Italy's increased fertilizer production. They are ANIC, the affiliate of the ENI Group (National Hydrocarbons Agency); the Edison Group; Montecatini; and Rumianca.

The ANIC plant, in Ravenna, produces 1,000,000 tons of nitrogenous fertilizers annually, in addition to about 90,000 tons of synthetic rubber. The plant was designed and built in just two and one-half years, a speed perhaps without precedent for such a giant plant. It occupies an area of more than 500 acres linked to the Adriatic Sea by a navigable canal. Ammonium sulfate and nitrate were the first fertilizers produced at Ravenna, followed later by other fertilizers, as dictated by technical progress and new market requirements. The raw material for the production of ammonia-derived fertilizers is a mixture of hydrogen and carbon monoxide, which can also be produced, in case of stoppage of the acetylene plant, by partial oxydation of natural gas in a Texaco plant.

Part of the ammonia is converted, under pressure, into nitric acid, in an oxydation plant. The nitric acid is salified by a direct reaction with ammonia and mixed with limestone. Another salifaction plant is used for the production of ammonium sulfate. A new process in which gypsum is used as a raw material has been developed in Italy for use in this new plant. Basically, the process consists of a double-exchange reaction between the calcium sulfate, which is the gypsum constituent, and the ammonium carbonate formed by the carbonation of ammonia solutions.

Both salifaction plants are equipped with ample space for warehousing the fertilizers. A completely automatized system of conveyor belts moves the fertilizers into the silos where they are bagged and to the docks for loading on ships and railroad cars. The existence of a direct access to the sea facilitates the shipping of the products both to the domestic and the foreign markets, particularly the countries of the Mediterranean, and also of the Middle and Far East. Work now is in progress for the enlargement and dredging of the Ravenna inland harbor, which will allow the use of ships up to 15,000 gross tons.

The Edison Group's most important fertilizer plants started production in 1958. Currently, they are concentrating on the production of compound fertilizers, in addition to the conventional fertilizers. With the development of production facilities completed for the time being, the Group has undertaken a program of mining exploration, the principal objective being to assure an adequate supply of raw materials. Excellent results are reported in the field of potassium salts, with the discovery of deposits in Sicily.

The Edison Group's principal fertilizer plants are located at Porto Marghera, near Venice (operated by Edison's Chemical Division and by Azienda Industriale San Marco), at Priolo, in Sicily, and at Vado Ligure. The Porto Marghera plants are producing chiefly nitrogen fertilizers and calcium cyanamide. In 1959, the production capacity of nitrogenous fertilizers at the Porto Marghera plants reached 700,000 tons. The construction of the Priolo plant, designed chiefly for the production of compound fertilizers, was started in 1956, and production began in 1958. The plant is served by a 3,000 foot pier, completely mechanized for the loading and unloading of cargo ships and capable of handling 10-15,000-ton ships.

The Vado Ligure plant has been almost completely renovated and enlarged in recent years. It produces phosphate and compound fertilizer and, as are the other two Edison plants, it is excellently located with respect to both supply and outlet markets.

The Montecatini Company operates 40 plants for the production of powdered and granulated superphosphates. Their production, by far the largest in Italy, totaled 1,115,000 metric tons in 1959. Italy's' total nitrogen production capacity for agricultural and industrial uses is estimated to be 750,000 tons, with an actual production of 2,600,000 tons of nitrogenous fertilizers. Montecatini, with its production in constant development, produces about 40 percent of the total Italian figures.

Montecatini also has made a decisive contribution to the development of new plants and new production methods. The Fauser-Montecatini patents, of course, are in use all over the world. The company is doing major work in the production of urea containing 45 to 46 per cent nitrogen. On a world-wide scale, the 33 plants producing urea through use of the

(*Continued on Page* 108)

As a result of the considerable increase in plant production capacity, Italian chemical fertilizers are being exported in increasing quantities to foreign markets. Ammonium nitrate exports to Yugoslavia, for instance, almost doubled between 1955 and 1959, while exports to Egypt increased nine-fold. The total value of Italian fertilizer exports has increased from $24 million in 1955 to $51.5 million in 1959.

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Glycols, Tall Oil Compounds Reduce Malathion Decomposition

The following discussion is a review of a paper by J. A. Polon and E. W. Sawyer, Jr., of Minerals & Chemicals Phillipp Corp., N. J., which was presented at the March, 1961 meeting of the American Chemical Society, St. Louis, Mo.

SINCE the introduction of the phosphate-type insecticides, much effort has been expended on the development of satisfactory dust formulations of these toxicants. Because of the inherent instability of the phosphates and their susceptibility to decomposition by the catalytic activity of surfaces of various solids, the formulation of adequate dry compositions has been extremely difficult. This instability has been particularly evident on mineral carriers that exhibit high-sorptive capacity. This factor has resulted in the use of carriers with lower sorptive capacities and other less attractive properties as the bases for dusts. For example, malathion, a major product of this type, has been prepared on many low-sorptive capacity carriers which give less decomposition but demonstrate poor flowability and application characteristics.

Considerable work has been carried out to determine the cause of malathion decomposition. The results reviewed here are based on studies undertaken to obtain comparative data on the decomposition of malathion when impregnated on low and high-sorptive carriers, and the effect of various additives on decreasing malathion decomposition when impregnated on high sorptive carriers.

Comparative stability data for 5% malathion dusts using various carriers showed that, of the samples tested, the attapulgite dusts were the least stable. Approximately 65% decomposition was obtained during the accelerated test for LVM* attapulgite, whereas for RVM** attapulgite there was approximately 47% decomposition. The value for decomposition reported for montmorillonite was 32%. Combinations of kaolinite with diatomite as carrier gave the most stable dust of three combinations tested (kaolinite with a diatomite; montmorillonite and an attapulgite; kaolinite and attapulgite). However, flowability measurements as conducted in the laboratories of Minerals & Chemicals Phillipp Corp., indicated that this type of product exhibited poor flow properties. Poor flowability was also demonstrated by the dusts produced using kaolinite as the sole carrier.

Studies on the stabilizing efficiency of mono-, di-, tri-, and polyethylene glycols; propylene glycol; and alkyl ethers of mono-, di-, and triethylene glycols indicate that propylene glycol, Carbowax 200, and the butyl ether of diethylene glycol show the most promise of all the glycols and glycol derivatives tested. Use of 7% diethylene glycol is capable of changing the surface acidity of LVM attapulgite from less than .8 to 3.3, — however, it does not completely eliminate the malathion decomposition. It was then concluded that either the diethylene glycol did not decrease the surface acidity sufficiently to prevent decomposition, or that causes other than, or in addition to, surface acidity are responsible.

Clay properties, other than surface acidity, which were likely to cause or support the decomposition of malathion were considered. It has been shown that the presence of moisture in a carrier increased the rate of decomposition, but removal by drying of the carrier did not eliminate the decomposition. An alkaline condition on the clay surface as a cause of hydrolysis is a possibility when the heterogeneous nature of adsorbent surfaces is realized. LVM attapulgite, for example, shows surface acidity values (H_0) of less than 0.8 when dry, but when slurried in water, exhibits a pH of 7.5-9.0. Metallic salts (calcium and magnesium) could possibly provide the alkaline condition on the clay surface. Therefore, an alkaline-site theory is proposed as a cause of decomposition of the P-S-C linkage by hydrolysis. The factors lending validity to this theory were checked by treating LVM attapulgite with a variety of agents which, because of their structure and active groups, would tend to interact with alkaline sites or free alkaline materials.

Over one hundred different additives at various concentrations were investigated for their stabilizing effects. Of the additives investigated, the tall oil compounds showed the most promise, considering both cost and efficiency of stabilization. The materials tested included: crude tall oils, distillation heads, distilled whole tall oils, distilled tall oils with high rosin acid contents, and distilled tall oils with high fatty acid contents.

The most efficient and economical stabilizers studied were found to be: two distilled whole tall oils, Indusoil M-28 and Acintol D; and Acintol FA2, a distilled tall oil fatty acid. As with the glycols, however, the tall oil compounds did not completely inhibit the decomposition. It was found also that the treatment of LVM attapulgite with varying amounts (up to 8%) of Indusoil had no effect on the surface acidity. This would indicate that the mode of stabilization is other than the neutralization of surface acidity, as is indicated for the glycol deactivators.

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*LVM — low volatile matter (6-8% VM).

**RVM — regular volatile matter (12-14% VM).

Fertilizer Views and News

by Vincent Sauchelli

Dr. Sauchelli is a Consultant to the Agricultural Chemicals Industry.

Views on Complex and Metaphosphate Fertilizers

> **The fertilizer industry has become one of the very important branches of the chemical industry. It is rapidly advancing its chemical engineering processing and recent developments presage an inevitable trend toward more high-analysis chemical compounds for fertilizer use and will involve significant changes in future manufacturing and marketing organizations.**

Complex Fertilizers

IN fertilizer literature, the term "complex fertilizer" is more and more frequently met with. Originating in Europe, the term has spread to other parts of the world. Is this another case of misnomenclature? Why do we in this industry seem to favor this sort of thing? We mis-name P_2O_5 as "phosphoric acid" and prefer to retain the system of oxides fashioned long ago by Berzelius rather than adopt more precise terms. Tradition and custom of the trade? Reverence for the past is excellent to a point, but there comes a time when a change to greater precision is desirable. That time is now.

Recently, in foreign journals, some correspondents with the editors question whether there is sufficient distinction between it and the commonly used names "mixed fertilizers" and "compound fertilizers" to justify the new designation. They claim it is a distinction without a real difference.

Those who introduced the term apparently intended to define a compound fertilizer in which the ingredients are not merely physically mixed, but are chemically combined. The typical example is nitric phosphate, the product resulting when phosphate rock is acidulated with nitric acid. But in this case, the term "nitric phosphate" or "nitrophosphate" is accurately descriptive and to call it "complex" adds nothing but confusion. Surely, when phosphate rock is acidulated with other acids, such as sulfuric, the resulting product is as chemically combined as in the case of nitric acid, but it has never been necessary to call it "complex." The ammoniation of superphosphate or phosphoric acid results in a chemically combined material, but we have not considered it necessary to call the products "complex fertilizers."

The term "compound" has often been used in the industry to designate either chemically combined materials such as superphosphate or a physical mixture, the so-called "mixed fertilizer" of the trade. The term "straight" frequently is used also to refer to a simple chemical compound such as ammonium sulfate or superphosphate. Sometimes the term "complete fertliizer" is used to refer to a mixture supplying N, P and K, the legally established trio of the industry. The distinctions have developed in the trade largely for reasons of commercial expediency. Usage over many years has conferred on them a sort of halo. Perhaps under the circumstances we shall have to make the best of the situation and accept the terms "mixed," "compound," "single," and "complex," despite the fact that they are illogical. We have been able to muddle through with "P_2O_5" and "K_2O" and "muriate" all these years despite the confusion they generate, so perhaps "complex" will likewise be accepted. But I, for one, believe the term is superfluous and should not gain currency in our industry. It would be interesting to have readers comment on this subject.

Metaphosphates for Farm Use

Recently, two large fertilizer manufacturers—one in Scotland, the other in the United States—each announced a concentrated phosphate. The American product, designated as 8-40-0, is magnesium ammonium phosphate, its chemical formula being $MgNH_4(PO_4)_3$. It comprises 8% N, 40% P_2O_5 and 24% MgO. The Scottish product, potassium metaphosphate, $(KPO_3)_n$, contains 60% P_2O_5 and 40% K_2O, is non-hygroscopic, water-insoluble and non-caking; it is, however, a source of available nutrient potassium and phosphorus.

Several years ago, TVA introduced calcium metaphosphate, containing about 62% available P_2O_5. This was one of the first of the metaphosphates for fertilizer use. Unlike the superphosphates, the P_2O_5 in this compound is not water-soluble and it does not react with ammonia or ammoniating solutions. But by treating it with a mineral acid, it is possible to hydrolyze it and then process it with ammonia and other nutrient carriers to produce a high-analysis NPK type of fertilizer.

Another metaphosphate, ammonium metaphosphate (NH_4PO_3), containing 17%N, 73% P_2O_5, has been prepared on a pilot-plant scale at TVA. This compound is made by reacting ammonia with phosphorus pentoxide (P_2O_5) vapor at elevated temperatures (600° to 1000° F) and then hydrolyzing the intermediate compound to produce the metaphosphate. Its nitrogen and phosphorus are soluble in water to the extent of 70 to 80% and the P_2O_5 is 96 to 99% soluble in neutral ammonium citrate solution. Greenhouse tests indicate it is an excellent fertilizer. Undoubtedly, this ammonium metaphosphate will advance to the commercial production stage sometime in the future when the process becomes practicable.

Do these developments indicate a trend toward high-analysis orthophosphates and metaphosphates for farm use? The fertilizer industry has become one of the very important branches of the chemical industry. It is rapidly advancing its chemical engineering processing. I feel certain that these developments in concentrated phosphates presage an inevitable trend toward more high-analysis chemical compounds for fertilizer use and will involve significant changes in future manufacturing and marketing organizations.★★

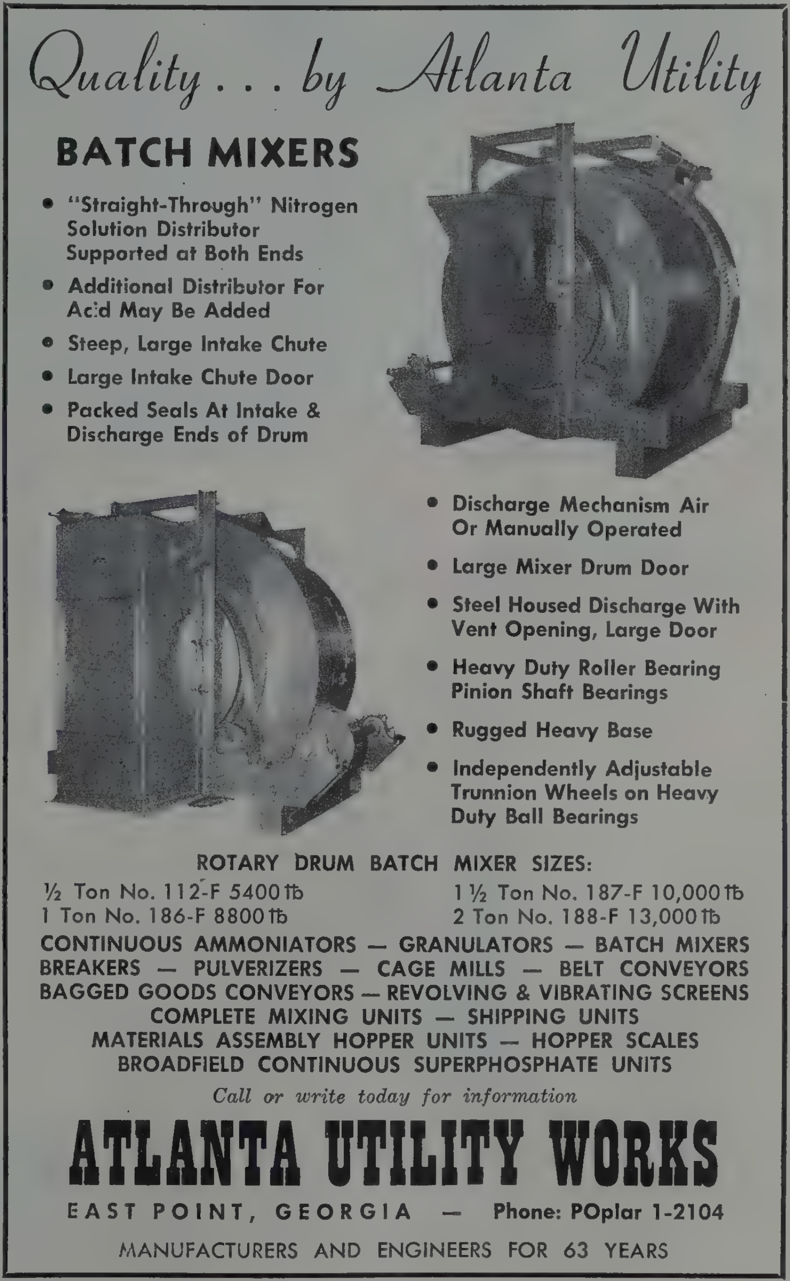
To Discuss The Future

George H. King, director of the Georgia Agricultural Experiment Stations, will discuss the future of agriculture at the 1961 summer meeting of the Georgia Plant Food Educational Society. The meeting is being held June 6 and 7 at the Wanderer Motel on Jekyll Island.

Also among the speakers are J. Fielding Reed, southern director of the American Potash Institute; Robert Wheeler, director of instruction, College of Agriculture, University of Georgia; and Samuel Tisdale of the Sulphur Institute.

Fisons In Joint Venture

Fisons Fertilizers Ltd., London, and Union Chimique Belge, Brussels, have formed a joint fertilizer manufacturing company to be known as Fison U. C. B., S. A. The company will build a plant at Zandvoorde, near Ostend, Belgium, with production of high-analysis granular compound fertilizers scheduled to start by mid-1962.



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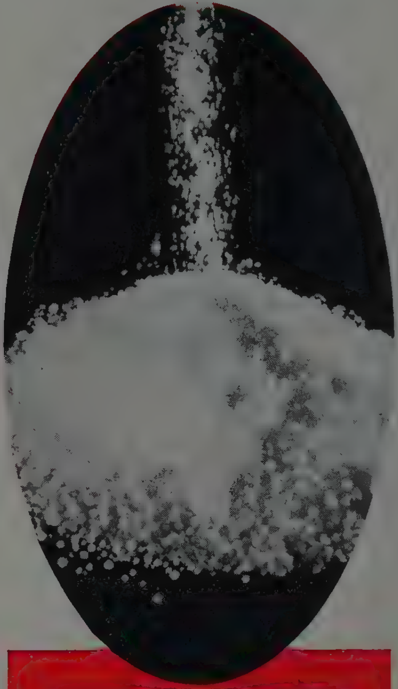

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ONE of the most recent farm supply organizations to take a major step towards serving the increasingly important market for home and garden products is the Cooperative Grange League Federation Exchange, Inc., Ithaca, N. Y. Earlier this spring, GLF opened its first home and garden store to be located in a shopping center. The store, which offers everything the growing number of suburban and rural home owners might need for growing lawns and gardens, is located in the Mid-Island Shopping Plaza in Hicksville, Long Island, New York.

The Mid-Island Plaza consists of nine major buildings and provides parking facilities for more than 8,000 automobiles. It serves a population in suburban Nassau and Suffolk Counties of more than two million people. The Home and Garden store is one of almost 90 fashion and service stores at the plaza.

The main building of the GLF outlet covers 12,000 square feet. A 10,000 square foot inside area, and a 2,000 square foot green house for outdoor nursery stock make up the bulk of the GLF facility. It is estimated that more than a half-million plants, flowers, bulbs, and seeds are on display, together with hundreds of lawn and garden chemicals and tools.

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A gift area at the Home and Garden store is proving to be a strong attraction for women shoppers. It is part of the Nurseryland department, which also includes a 2,000-square-foot green house (right), where cut flowers and potted plants are sold. The entire store is arranged so as to make self-service convenient, and a pleasant atmosphere for shoppers is created by the maximum use of light and color. The greenhouse is augmented by 10,000 sq. ft. of outside sales area.

other, smaller GLF units throughout Long Island. A complete pet shop, gift department, and food specialties department provide a field day for the impulse buyer.

Supermarket-type carts and check-out counters expedite shopping, while a staff of more than 20 experienced GLF employees are on call to provide authoritative answers to home owner's questions. Each of these employees is well-equipped with the knowledge necessary to answer any horticultural questions put to them. In addition, landscape consultants are available to provide more free advice. Other complimentary services offered by GLF to shoppers at the Home and Garden store include soil analysis, flower and plant arrangement service, lawn and garden tips, and a do-it-yourself home gardener's department. GLF's home and garden products are sold under the Squire Applegate brand name and include a complete line.

With stores already established to service farmers, and with 40 years of experience in supplying them with seed, fertilizers, pesticides, tools, and equipment, GLF has the background and facilities to meet all needs of the home and garden market. GLF operates four of the nation's largest feed mills, seven seed processing plants, 13 fertilizer and chemical plants, and eight regional hardware warehouses. The GLF hardware business handles thousands of items.

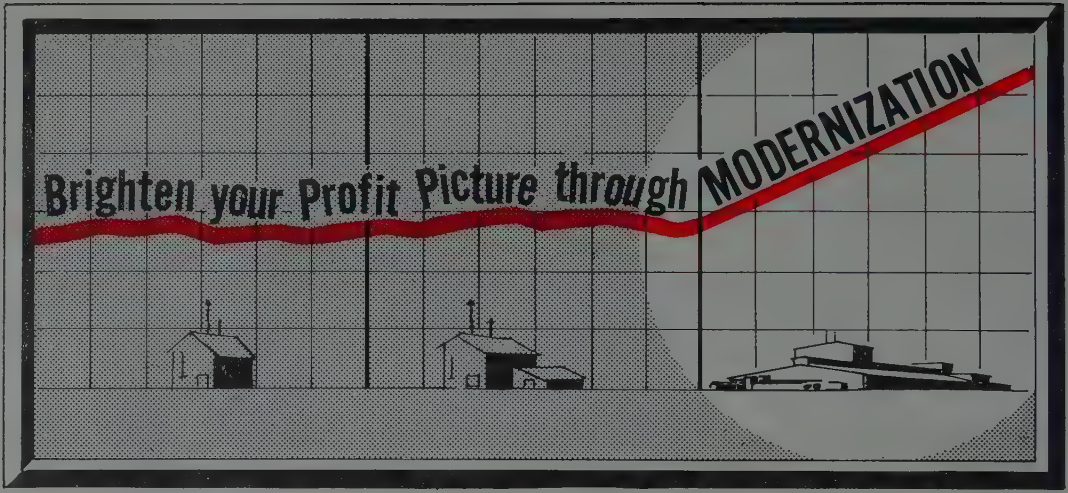
An indication that the Hicksville store will serve as more than an outlet for home and garden supplies, and will, in fact, provide a testing ground for future GLF home and garden operation is given by E. J. Biggie, manager of the GLF Home and Garden Department, who points out that the Hicksville store is "not necessarily the ultimate in such centers." Experience gained at this operation, he feels, will serve as the basis for planning future GLF home and garden outlets.

Figures contained in the 1961 *Ford Almanac,* and reported in the April issue of *NAC News and Pesticide Review,* indicate that there is plenty of room for home and garden stores. Last year, 40 million home gardeners spent $4 billion in their pursuit of what now is termed America's No. 1 Hobby. Home owners purchased $935 million worth of shrubs and trees and spent $2 billion for lawns and lawn care. Rose growers, alone, spent $100 million.

Willard O. Marshall, Jr., manager of the Hicksville store, has had more than 10 years experience with GLF retail outlets on Long Island. William H. Hibbitts, district manager for GLF, feels that the new store's location in a huge shopping center will prove to be beneficial to both GLF and the Mid-Island Plaza.

The unusual features of the store, he says, such as free information, charge accounts, gift wrapping, pet shop, food specialties, greenhouse, and florist, will provide the incentive for shoppers to continue coming to the Mid-Island Plaza and will attract shoppers already brought there by one or more of the other 90 stores at the plaza.★★

The Mid-Island Plaza offers parking facilities for 8,000 automobiles and serves a population of more than two million people. Shoppers can park close to any store in the plaza.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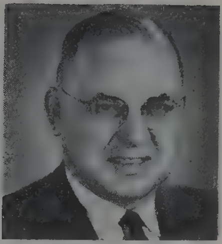

by F. T. Nielsson
International Minerals &
Chemical Corporation

Rotary Ammoniator and Granulator Technology

Part Two: Distributors

Within the plants of an individual company there can be found a variety of sizes of ammoniators. It is only by understanding the ideas behind the rotary ammoniator that field adaptation for each installation can be made. Conclusion of a two-part report.

THE device that adds the nitrogen-containing fluid either as anhydrous ammonia or nitrogen solution has been called a sparger by some and a distributor by others. In the early work (1), while testing the addition of anhydrous ammonia to triple superphosphate, it was found that the addition of ammonia in a decreasing ratio from the feed to the discharge end resulted in the greatest reversion of P_2O_5, with the least loss of ammonia.

On the other hand, the addition of ammonia in an increasing ratio from feed to discharge resulted in the least amount of reversion but the greatest loss of ammonia.

As a practical compromise, less ammonia addition at the ends of the distributor with more in the center yielded the best overall results. The curve distribution with some modifications has become generally accepted and the use of nitrogen solutions has not altered the basic concept of adding more ammonia toward the center of the distributor than at either end.

The use of acid to neutralize the ammonia above that which would react with the phosphates present in the bed was investigated a few weeks prior to the 1953 demonstration. About the only firm finding at that time was that fuming made it necessary that the acids be added below the bed.

Since the rotary ammoniator has been accepted commercially, more experimentation has been done with the placement of acid and solution distributors in relation to the axis of the drum, together with the direction of the entry of the fluids into the bed.

Before the bed in the ammoniator becomes damp, it has a low angle of repose and is displaced less toward the vertical than after ammoniation begins. The fume present during ammoniation may prevent good observation of the bed under ammoniating conditions (Figure 5). Some operators have mistaken the flattened position of the bed before ammoniation to be its operating position and have mistakenly placed distributors in the 4:30 to 5:00 o'clock position under the impression that they would be in the deepest part of the bed. Actually, it has been found that a preferred position is to have the centerline of the distributors on a radius spaced 25 to 30° down from the horizontal in the 3:45 - 4:00 o'clock position (Figure 6). An added advantage of having the distributor in the higher position is that at rest, when the bed has slumped, it is relatively easy to examine the condition of the distributor.

Placing the distributor low slows down the bed movement before it has a chance to get started, resulting in poor absorption, local overammoniation and wet spots.

Where acid and solution are added simultaneously, it has been found that the least fume is generated when the acid and solution orifices are 180° apart, with the plane of the orifices lying in a circle concentric with the shell. To increase the retention time of the ammonia, solution streams are directed against the rotation of the bed, and to minimize corrosion of the distributor, acid streams are

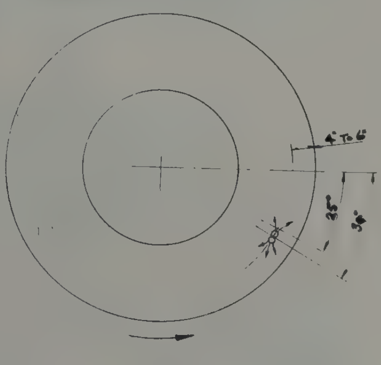

Figure 6

directed parallel to the rotation of the bed. However, despite the best anti-fume position, solution orifices directed into the bed become plugged if it is not a routine practice to admit compressed air into the solution distributor whenever the flow of solution is stopped. As a result, a satisfactory compromise appears to be the direction of the solution orifices toward the wall of the cylinder.

Directing the acid flow against the wall of the cylinder appears to increase the hardness of the crust that generally forms on the interior wall.

It has been reported (5) that if the orifices are drilled in a spiral pattern encircling the solution and acid distributors, localized areas of intensive reaction (hot spots) are minimized, with a concomitant decrease in fume evolution. The spiral pattern should ensure also that a large number of orifices will remain open.

The longitudinal distributors described above probably are the most efficient means of adding solution and acid to an ammoniator. Their chief disadvantages are that (1) they hinder the rolling action of the bed; (2) the orifices tend to enlarge from the outside because of the secondary reactions that occur during ammoniation; (3) damage requires replacement of a completely new distributor; and (4) severe enlargement of one orifice results in excessive additions of solution or acid at one spot, leading to severe fuming, wet spots and possible flash fires.

A compromise "downcomer" distributor is suggested (6) that overcomes the disadvantages mentioned above, although there may be some sacrifice in efficiency.

The downcomer distributor is illustrated in Figure 7. It consists of a horizontal header positioned above the bed. Orifices are drilled in the header at 9 inch to 12 inch intervals. A pipe is welded around each orifice to direct the flow of liquid. The pipe terminates in a coupling that is positioned just above the top of the rolling bed. Up to this point the piping is made of stainless steel. Extra-heavy black iron pipe nipples are inserted into the stainless steel coupling to direct the solution under the bed. Best results have been found when the solution nipples are "fishtailed," as shown in Figure 7, but that is not necessary.

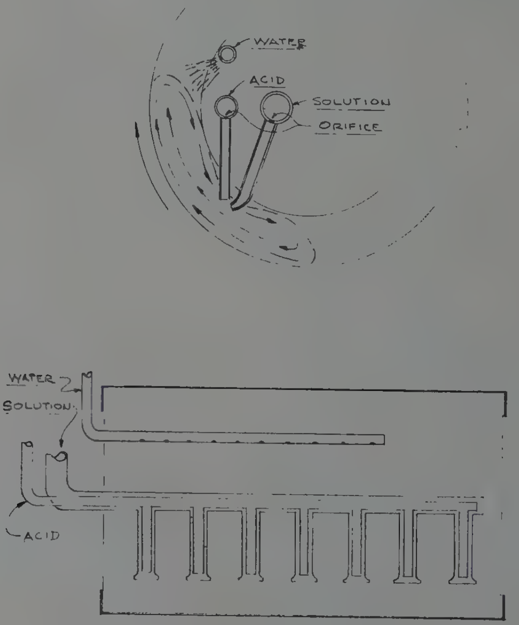

Figure 7

The first result of installing the downcomer distributor is an increase in the rolling action of the bed and a decrease in the power required to operate the ammoniator.

The next result is the decrease in maintenance of distributors. Because the orifices are not subject to bed reactions, their life is indefinite. If an iron nipple wears or breaks, it is a simple matter to install a new one at little expense.

In addition, if a nipple breaks during operation, only that part of the total solution or acid flow is directed into the bed that is regulated by the corresponding orifice. This is in contrast to the longitudinal distributor that discharges the entire flow in one spot if a break occurs. Suitable proportions are a two inch header for solution with three-quarter inch downcomers, and a one inch header for acid with one-half inch downcomers.

Easy change of distribution is another advantage of the downcomer distributor.

For ammoniating solid phosphates, it has been found best to use an unpaired solution downcomer at the feed end, followed by paired acid-solution downcomers for the remainder. For ammo phos grades, it has been found best to use acid-solution pairs throughout. For 1-4-4 ratios, one-half of the downcomers may be used to develop a small area of high temperature. With 1-1-1 ratios, all the downcomers are used to dissipate the heat of reaction. Any downcomer not in use is closed off by removing the iron nipple and inserting a pipe plug in the coupling.

The premise that acid and solution will flow out of the various orifices in proportion to the area of each orifice holds only if the header pipe is full. To insure that the header pipe remains full, the sum of the areas of the orifices should not be more than one-half of the cross-section area of the header. Failure to follow this rule

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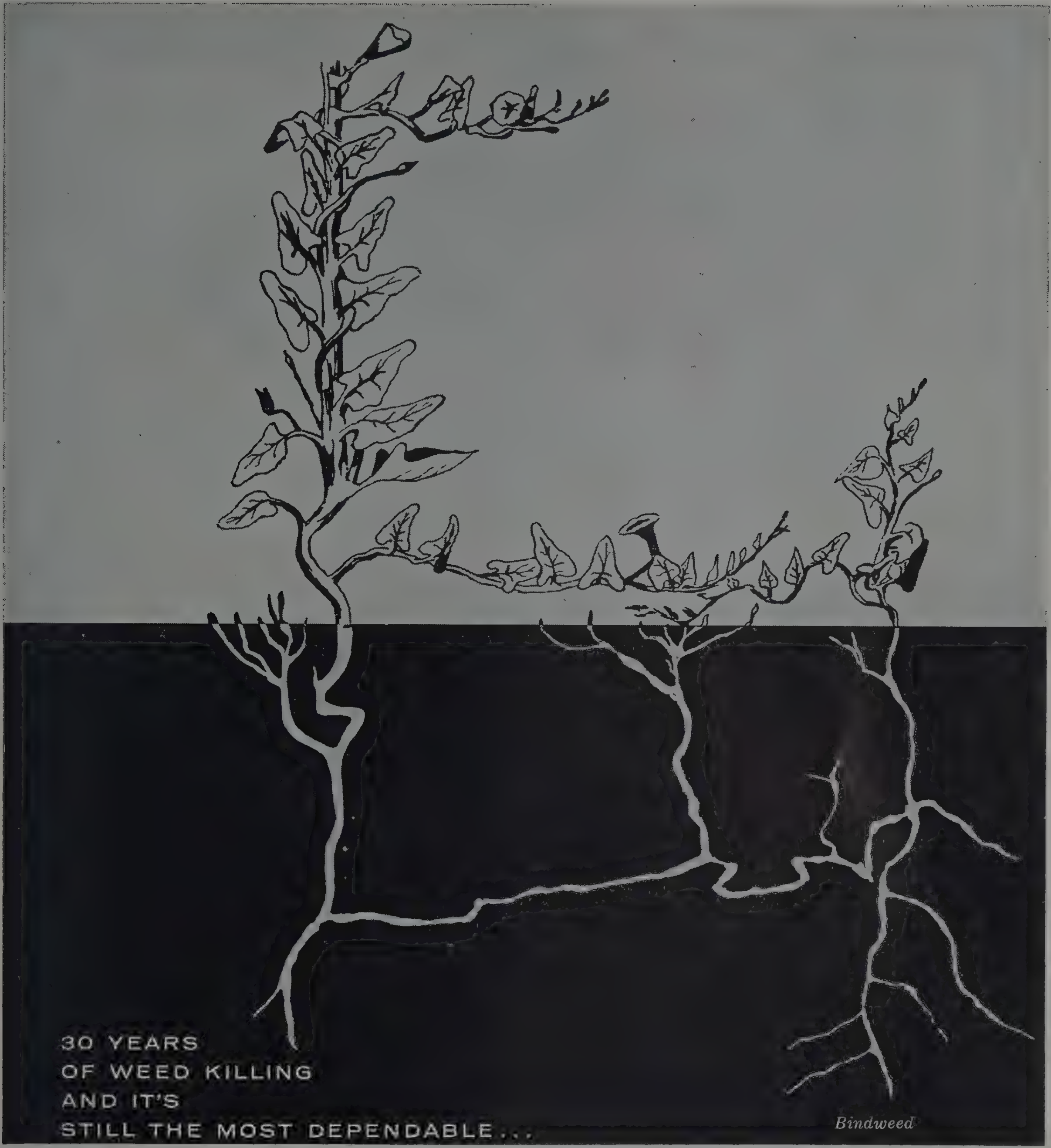

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Some Helpful Hints

Handling Claims For Damages

If a claim for damages is filed against an applicator, it should be examined at once. A friendly and sympathetic talk with the injured party many times will lead to a prompt settlement of the claim without the necessity for court action. The best way to prevent litigation, of course, is to be as careful as possible in the application of chemicals.

THERE are a number of ways in which people can get into trouble through the use of chemicals on crops. For the most part, legal problems connected with the use of herbicides or any other type of agricultural chemical are those connected with damages of some sort. As a rule of thumb, the user of the chemical is responsible for the results of his actions.

If the owner's own pine trees are killed, that is all right. If the applicator is foolish enough to apply a chemical without taking adequate precautions to safeguard his person and he sustains severe irritation of the eye, or even dies from the result of the contact, that is his business. The trouble becomes much more complex when another party is involved. When these incidents occur, and sooner or later they will occur unless particular care is taken, it makes very little difference whether it was an accident, whether it was done on purpose, or whether it was almost an act of God—that is, one of those things that just could not have been prevented.

The person who was using the chemical is financially liable for the damages which have been incurred. It is advised that a friendly settlement be made whenever possible in matters of this kind. Experience indicates that no one really wins a lawsuit unless it is the lawyer, and sometimes it is questionable how he really comes out in the long run. In one case which may be cited—this involved chemicals in chicken feed — settlement was made for $2,500. It was reported that the attorney for the plaintiff received $1,500 and the owner of the chickens was given the remaining $1,000. Judging from the time it took and the amount of expert testimony that was presented by the feed company, it probably cost the company $10,000 to defend the case. Who won? It was not the feed company, and it certainly was not the chicken farmer. So when damages occur, it is strongly recommended that the persons involved get together and try to work out some reasonable settlement.

In many cases, of course, there will be people who think that this is a very easy way to make a crop. They may say, "Well, the old Gulf Land Company has a lot of money, and they're a big company. I think maybe we ought to help them spend some of it." Such people make claims for damages that are false and completely unjustified. That does happen; we may as well recognize it. In such cases, it certainly is not recommended

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This article is based on a talk by Ernest A. Epps, chief chemist, Louisiana Department of Agriculture, at the 9th annual Forestry Symposium, held last year at Louisiana State University. The full text of this and other papers has recently been published by the University in a book, "The Use of Chemicals in Southern Forests."

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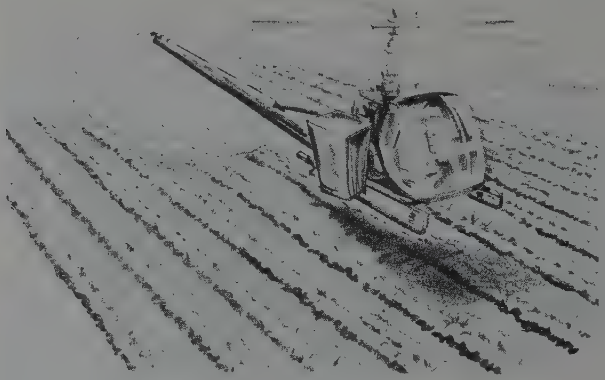

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that anyone be paid off. That would encourage similar attempts in the future. As a rule, however, when legitimate damage claims arise as a result of an operation, it is much better to settle them quickly, in a friendly way, and be through with them. If they cannot be settled in this way, court action is required.

The best way to prevent litigation, of course, it to be as careful as possible. The more care that is exercised, the less likely are claims to arise and the better is one's position to ward off unjust or fraudulent claims.

One point that may be worth stressing is that if a claim is filed against an applicator or chemical firm, it should by all means be examined at once. If a company representative will talk to the injured party in a friendly manner and show real concern (after all, his four acres of cotton is important to him), a great deal may be accomplished. The company may own a million acres of pine timber, and four acres of cotton does not seem like much beside this, but the farmer's cotton is important. It may be worth only fifty dollars, but it is all he has in some cases. So, a lot of grief may be saved at times by trying to adopt a sympathetic and understanding attitude toward the people who might make claims.

When and if claims are made, an immediate investigation should be carried out. All the facts should be collected, as well as all the evidence, including names, dates, and addresses. People's memories fail, witnesses become unavailable, and many other things can happen. Even after the initial investigation, the progress of the crop should be followed. The crop may have a few leaves curled up but no real damage done. Or the complainant may abandon his crop. In that case the defendant is in a much better position. If damage occurs to the crop, unless obviously it is a total loss, the damaged party is supposed to care for his crop to the best of his ability in order to salvage as much as possible. This is the same reasoning that requires a person to call the fire department if his house catches on fire. He can't just let his house burn down and then tell the insurance company that he wants a new house and furniture. It is important in damage cases that the damaged party try to protect and recover as much of his loss as possible. In some states—and this seems to be a growing practice — there are requirements that notice of damage must be given within a certain period of time after damage occurs. This gives the defendant an opportunity to protect himself.

Although there now are legal restrictions that govern the application of most chemicals, the development of additional restrictions is pretty much up to the

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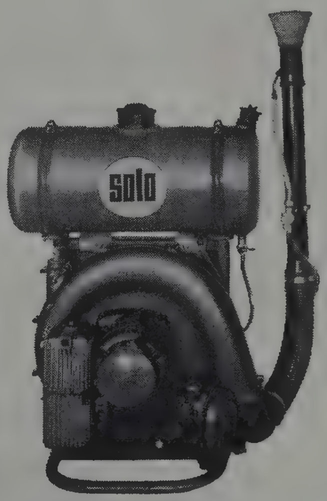

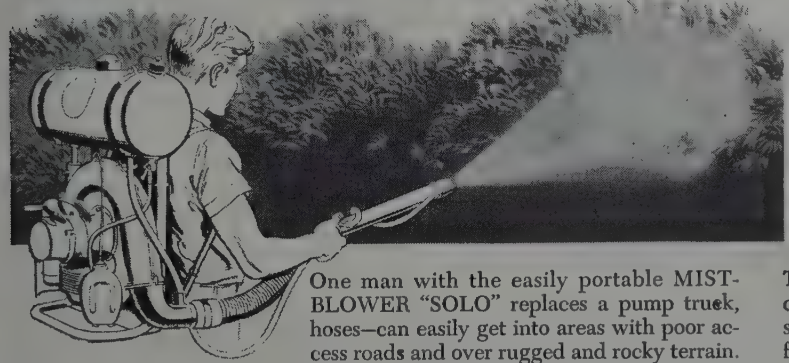

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Agavenco Acquires Span Flow

Agricultural Aviation Engineering Co., Santa Clara, Calif., has purchased the patent and manufacturing rights for the Span Flow aircraft dusting equipment from Nissen Aviation Products, San Jose, Calif.

Included in the Span Flow system is a supplementary wing onto which dust and other agricultural chemicals are metered. Aerodynamic forces on this wing spread the material uniformly across its span and the material then is carried downward in the built-in downwash of the system.

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Snow Aeronautical Co., Olney, Texas, manufacturer of the S-2A and S-2B agricultural aircraft, is offering a new version of the S-2B. Although the wings, empennage, and landing gear have not been changed, the modified B-model is equipped with a new fuselage which bears little resemblance to the original.

The cockpit is 17 inches farther forward and three inches higher. The engine has been lowered three inches, giving the pilot increased visibility. In addition, the fuselage now is metal covered, with removable top, bottom, and sides.

The cockpit area has been completely sealed off from the rest of the fuselage by means of a metal "shell." The instrument panel has been lowered somewhat and set at an angle, making it more readable from the pilot's normal viewing position. Fuel capacity in the new model is increased from 44 to 70 gallons, giving the S-2B a working range of three to four hours, depending on whether it is powered with an R-985 or R-1340 engine.

•

Heads Colorado Aerial Group

Clarence Tietmeyer of Grover, Colo., has been elected president of the Colorado Aerial Dusters and Sprayers Association. He succeeds Norman Kramer of Alamosa.

Other officers elected include Samuel Flint, vice president; Eldred Bristol, secretary; and Loren Inman, treasurer.

•

13 hp Potts Mist Blower

S. Frederick Potts, Crawford, Miss., is offering a mist blower that is powered by a Wisconsin 4-cycle, 13 H.P. engine. The unit delivers an air volume of 4,000 cfm; the velocity of which can be regulated at from 50 to 200 mph.

The sprayer can be mounted on a tractor, pick-up truck, jeep, or any similar vehicle. It is equipped for applying either concentrated spray, semi-concentrated spray, or conventional dilute spray.

AG CHEM

PEST ROUNDUP

by Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U. S.

Insect Conditions During April Indicate Need For Control

THE greenbug continued to cause damage in parts of Oklahoma and Texas during April. The insect was of concern throughout Oklahoma by the middle of the month, with spraying rather general. Populations, however, were showing some decline in the southwestern part of the State late in the month, but serious damage still was occurring in isolated fields of small grain in various areas.

In the Panhandle and Red River counties of Texas, greenbug population ranged from light to heavy. Counts as high as 5,000-6,000 per foot were recorded in several panhandle counties. Controls gave good results and wheat was reported as looking good.

By the latter part of April, greenbugs were appearing in the extreme southwestern portion of Missouri. Counts ranged from zero to several hundred per foot of row, with one field in Jasper County having a count of 2,000 per foot. Damaging infestations of the insect were reported from southern Crowley and Summer Counties, Kansas. Counts varied from less than one to 50 per foot of row in other Kansas counties reporting. Arkansas, New Mexico, Nebraska, and Colorado reported light populations the latter part of April.

Populations of the pea aphid were beginning to build up over a wide area of the country by late April. The insect was reported as being light on alfalfa in Delaware, Maryland, and Virginia, but evidence of increases were noted. In Illinois, counts in clover and alfalfa ranged from 26 to 130 per square foot. Counts were light in Arkansas, Kansas, Missouri, and Nebraska, but ranged from moderate to heavy in Oklahoma.

Pea aphid populations ranged from 1,200-1,500 per sweep on volunteer Hubam clover in Bell County, Texas. On vetch in several other central Texas counties, counts ranged 500-1,000 per sweep. Widespread infestations of varying degrees on leguminous crops were reported from other sections of the State. In New Mexico, heavy, spotted infestations damaged alfalfa in Chaves and Eddy Counties, but populations were on the decrease in northern Dona Ana County. The aphid was heavy on alfalfa throughout Arizona and in localized areas of Utah. Populations varied widely in Nevada. Generally, counts were light, but in one field near Reno, populations of several thousand per square foot caused heavy damage.

The pea aphid was building up in the Clearwater River area of Idaho much earlier than observed in the past few years. Populations in all fields checked were much above those reported for the same time in 1960, and indications were that there was some overwintering in the nymphal or adult stages.

By the latter part of April, the alfalfa weevil was rather active in both eastern and western United States. In Delaware, larval numbers were on the increase in Sussex County, with injury more noticeable in untreated alfalfa. Heavy injury was noted in a Prince George County, Maryland, location, but populations were light in other sections of the State. In Virginia, first infestations were found in fields which had not been treated in the fall of 1960. Many infestation have been treated this spring with good results. Populations in Morgan County, Georgia, averaged 55 per sweep, but fields treated last fall averaged one larva per 10 sweeps. In South Carolina, the weevil has destroyed most of the alfalfa crop in Cherokee County. The portion of the crop remaining had received fall treatment. Twelve Tennessee counties were reported infested by the alfalfa weevil for the first time during April.

Alfalfa weevil adult feeding was noted in some fields of alfalfa in Colorado and it was expected that controls might be needed after the first cutting of hay. In Goahen, Laramie, and Platte Counties, Wyoming, adults averaged one per square foot of alfalfa crown. Controls were necessary in localized areas of Utah and it was estimated that, by late April, 75 percent of the alfalfa had been treated in Wasatch County. Weevil populations were low in Idaho, and light activity was reported from Nevada and Oregon.

Mites were causing damage to wheat in local areas of Kansas and were increasing on that crop in Colorado. Light populations were reported from Oklahoma and Nevada.

Some cotton insects were beginning to show activity by the

(*Continued on Page* 107)

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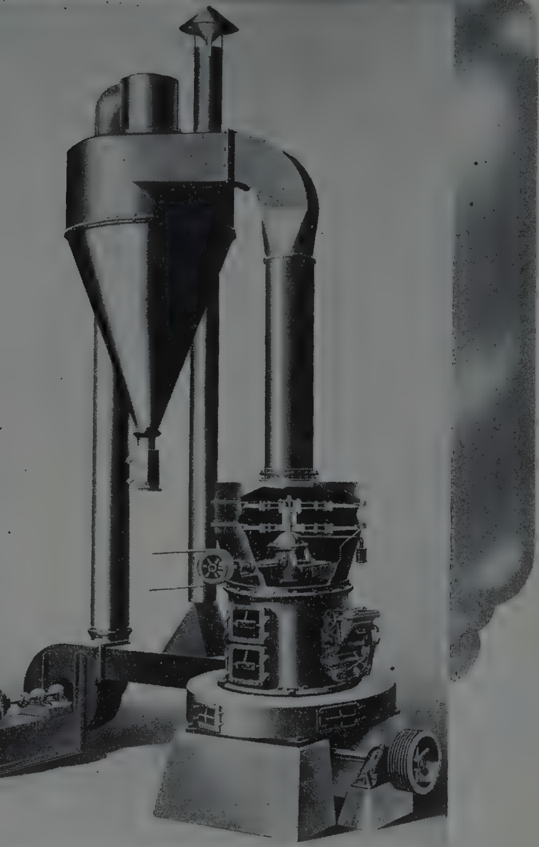

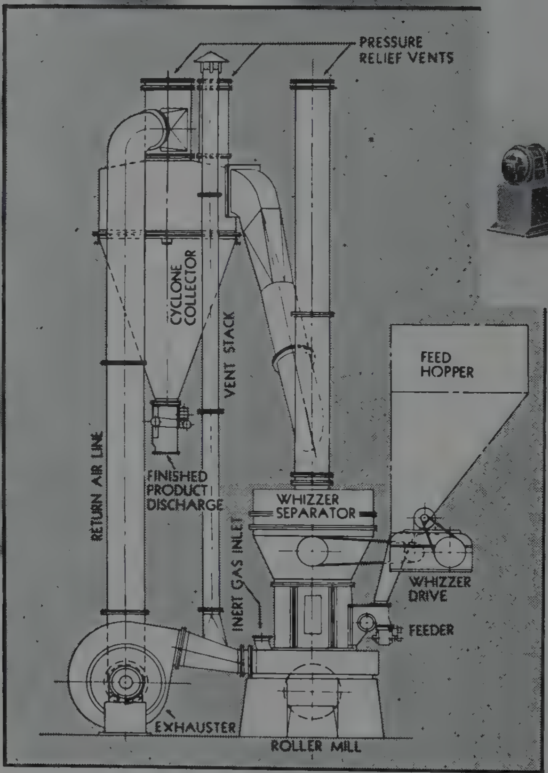

Write for new insecticide Bulletin No. 84A which describes the application of Raymond Roller Mills and Imp Mills in pulverizing all of the modern formulations.

Production of powdered sulphur is a critical grinding operation. The modern Raymond Roller Mill is recognized as the outstanding unit in this field since it has special features built into it, which provide a safe, economical, trouble-free method for handling this sensitive material.

Mill system is continuously blanketed with inert gas that will not support combustion.

Piping and collectors of heavy gauge sheet steel with relief vents on mill and collector.

Special valves for discharging material from cyclone collector with minimum air leakage.

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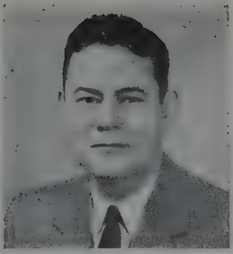

by Paul Miller

This department, which reviews current plant disease problems, is a regular feature of AGRICULTURAL CHEMICALS. The comments are based on observations of collaborators of the Epidemiology Investigations, Crops Protection Research Branch, USDA, Beltsville, Md.

Control Of Fusarium Yellows Of Celery By Soil Fumigation

CELERY varieties resistant to attack by the soil-borne fungus *Fusarium oxysporum* f. *apii* usually are planted where Fusarium yellows is a problem. Colorado growers, however, prefer certain susceptible varieties, according to Ralph Baker and Douglas J. Phillips, of Colorado State University, and Charles Martinson, of Oregon State College (1). Baker and his associates tried soil fumigation with trichloronitromethane (chloropicrin) and a proprietary formulation containing 50% chloropicrin and 50% chlorinated C_3 hydrocarbons including 1,3-dichloropropene, 1,2-dichloropropane, and related chlorinated hydrocarbons (Nemex, formerly Morton Chemical Company EP 136), at the Colorado State University Experiment Station in attempts to find a practicable chemical means of controlling the disease. The chemicals were injected at the rates of 470 and 790 pounds per acre into sandy loam soil in two fields. The treatments were rated on the basis of plant weight and incidence of Fusarium yellows at harvest. Results showed that effectiveness was correlated with the previous history of the disease. In one field, where losses had been slight, all treatments resulted in statistically highly-significant increases in plant weight and decreases in incidence of the disease. In the other field, where losses had been heavy, only chloropicrin at the higher rate was effective. Baker and his associates concluded that Fusarium yellows of celery could be controlled by soil fumigation with Nemex or chloropicrin, but that choice of chemical and rate of application would depend upon the amount of the disease previously present. They stated, however, that use of the fumigants, even at the lower rates of application, might not be economically feasible.

Evaluation Of DBCP

During 4 years of experiments, in cooperation with the Georgia Agricultural Experiment Station, J. M. Good (3), of the Crops Research Division, Agricultural Research Service, United States Department of Agriculture, studied the effectiveness of various formulations of 1,2-dibromo-3-chloropropane (DBCP) for control of the root-knot nematode *Meloidogyne incognita incognite,* and the reaction of several different truck crop plants to the chemical. Under the conditions of the experiments, which differed from year to year, appropriate dosages usually resulted in satisfactory control of root knot. Some kinds of plants were injured. Tomato plants, especially, showed evidence of phytotoxicity in every test with DBCP. The injury usually was slight enough to have escaped notice, except under the controlled conditions of the tests, according to Good, who remarked that on heavily infested land the improved plant growth resulting from nematode control would probably mask DBCP injury to the roots. Preplanting applications tended to give slightly better control and to cause less injury than applications made at planting time. Good listed depth of placement, method of formulation, soil moisture, soil temperature, timing of application, and kind of plant as possibly contributing to injury from DBCP, but concluded that the fundamental factor evidently was the rather low volatility of the chemical. To minimize injury, he advised placement of the chemical deep enough to be out of contact with seed or plants, minimum rates of application, avoidance of application in cold or wet soils, and use as long before planting as possible. Of sourse, DBCP should not be used for crop plants known to be sensitive to it.

Evaluation Of Treatments

J. F. Darby (2), of the Central Florida Experiment Station, Sanford, Florida, compared a number of chemicals used as soil treatments for effectiveness in controlling soil-borne fungi and nematodes that attack tomatoes, as well as weeds and grasses common in tomato plantings. Rates and methods of application differed according to chemical. Darby obtained excellent control of the damping-off fungi *Pythium* spp., *Pellicularia filamentosa* [most common in the imperfect stage, *Rhizoctonia solani*], and *Pellicularia* [*Sclerotium*] *rolfsii,* of unspecified weeds and grasses, and of the root-knot nematode *Meloidogyne incognita incognita,* with vaporized methyl bromide, methyl bromide in solution (Brozone), and a fortified methyl bromide-chloropicrin mixture (Trizone). Good control resulted also from applications of 3,5-dimethyl-1,3,5, 2H- tetrahydrothiadiazine-2-thione (Mylone 50% dust); sodium methyldithiocarbamate (Vapam); 1,3-dichloropropene-1,2-dichloropropane (D-D) 40%, allyl alcohol 50%, and emulsifiers 10% in a commercial formulation (Kildrench No. 3); emulsifiable D-D; and 85% acrolein (Aqualin). All treatments increased the yield of marketable fruit. No treatment significantly reduced percentage of fruit rot caused mostly by *Pellicularia filamentosa* and *P. rolfsii*, although, as mentioned previously, seedling attack by these fungi was well controlled. One month after treatment, the parasitic-nematode population in all treated plots was practically nil. Subsequent increase in populations varied with chemical and type of nematode. At harvest time, stubby root nematodes (*Trichodorus chrietei*) were fewer and root-knot nematodes were a great deal more numerous in plots treated with Vapam, Mylone, Aqualin, and Kildrench No. 3 than in plots treated with the methyl bromide formulations.

Improving Fruit Tree Growth

Apple trees planted in soil chemically treated at planting time showed increases in growth amounting to as much as 40%, in experiments reported by P. M. Miller (4), of the Connecticut Agricultural Experiment Station. Most of the extra growth probably resulted from control of root-rotting fungi, particularly *Rhizoctonia solani*, rather than from control of parasitic nematodes, according to Miller. Effective chemicals included two fungicides, 8-hyroxyquinoline sulfate (oxine sulfate) and 20% pentachloronitrobenzene (PCNB; Terraclor, and a nematocide, 1,2-dibromo-3-chloropropane (DBCP) in a 50% emulsifiable concentrate (Nemagon EC-2). Both fungicides are known to be rather specific for use against *R. solani* and neither possesses nematocidal properties so far as known. The nematocide DBCP, on the other hand, has been shown to be capable of inhibiting growth of *R. solani*. The ineffectiveness of the other two nematocides tested, namely 10% granular 3,4-dichlorotetrahydrothiophene 1, 1-dioxide (PRD), and 75% emulsifiable concentrate of *O*-2,4-dichlorophenyl *O-O*-diethyl phosphorothioate (VC-13), provided additional evidence of the major role of fungi as the cause of root injury. Nematodes present in the soil used for the experiments included *Pratylenchus penetrans* and *P. pratensis, Xiphinema americanum, paratylenchus* sp., *Tylenchorhynchus* sp., and *Rotylenchus* sp. Miller considered that to affect growth of apple trees significantly, nematode injury to the roots must be accompanied by infection by *R. solani*. He discussed several factors that might have been responsible for the relative ineffectiveness of the nematocides, but concluded that most of the increased growth obtained in the test was due to control of root-rotting fungi. Both nematodes and fungi, however, could be controlled by treatment with both nematocides and fungicides, at little extra cost and, probably with considerable gain.★★

Literature Cited

(1) Baker, Ralph, Douglas J. Phillips, and Charlie Martinson. 1961. Control of Fusarium yellows of celery by means of soil fumigation. Plant Disease Reporter 45: 76-77. January.

(2) Darby, J. F. 1961. Evaluation of treatments for the control of soil-borne pests of tomato. Plant Disease Reporter 45: 58-61. January.

(3) Good, J. M. 1961. 1957 1960 evaluation of DBCP application rates, time of application, and phytotoxicity on selected crops in south Georgia. Plant Disease Reporter 45: 46-50. January.

(4) Miller, P. M. 1961. Improving growth of fruit trees by treatment with nematocides and fungicides at time of planting. Plant Disease Reporter 45: 42-44. January.

Watermilfoil Control Report

In a progress report on the control of Eurasian watermilfoil in Chesapeake Bay, presented at the January 6 meeting of the Northeastern Weed Control Conference, John H. Stennis, U. S. Fish and Wildlife Service, Laurel, Md., and Vernon D. Stotts, Maryland Game and Inland Fish Commission, said that the manner in which Eurasian watermilfoil completely dominates most areas in which it grows has resulted in a severe weed problem.

They reported that invasion of Eurasian watermilfoil in fresh and brackish waters from New York to North Carolina and Tennessee affects diversified interests including boating, sport and commercial fishing, and waterfowl hunting. Preliminary studies on herbicidal control of this problem plant indicate that 2,4-D granules applied at the rate of 20 to 40 pounds acid equivalent per acre give effective results in tidal areas. Time for treatment should be (a) when the plant reaches the water surface at low tide and before it flowers, (b) when the water temperature is above 20°C., and (c) when the tide is ebbing and near the period of low water slack.

Future studies are to be directed toward refinement of control techniques and evaluation of the toxicological effects of herbicides on fishery resources.

•

Strawberry Insect Control

The control of insects on strawberries is the subject of a brochure recently published by the Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, N. Y. "Thiodan for Strawberries" outlines to growers the pests controlled by Thiodan insecticide and recommendations for its application.

The brochure describes control measures for the three major strawberry pests — cyclamen mite, strawberry aphid and meadow spittlebug. It differentiates between the application techniques required for cyclamen mite in western areas as compared with eastern states and also details a pre-plant dip method for curbing this insect in transplants.

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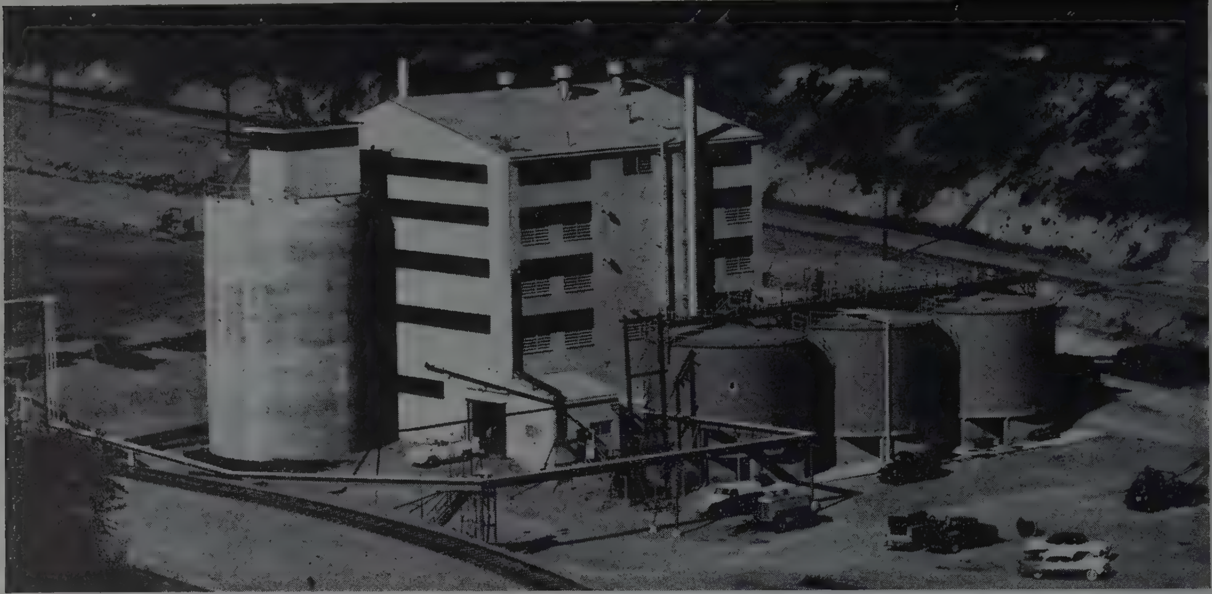


Aerial view shows the complete Phosphoric Acid Plant of The Bunker Hill Company at Kellogg, Idaho. Three 35′ Dorr Storage-Clarifiers are seen in the foreground.

SO_2 from zinc plant opens way for phosphoric acid production at

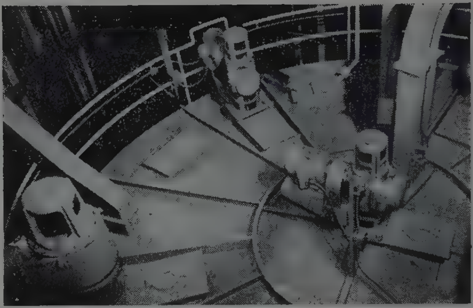
THE BUNKER HILL CO.

Another example of Dorr-Oliver engineering

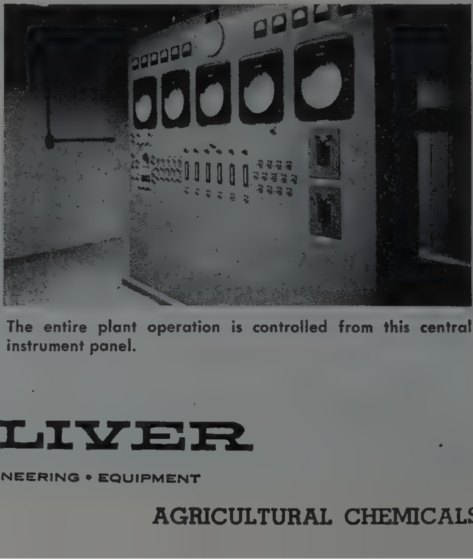
Operated in conjunction with the Company's important zinc reduction facilities nearby, the new Phosphoric Acid Plant of The Bunker Hill Company, Kellogg, Idaho, was constructed in 42 weeks, put into production in January this year, and very quickly achieved capacity and efficient operation. The plant has a design capacity of 130 tpd of 54% P_2O_5 product acid (70 tpd P_2O_5).

The Dorrco Strong Phosphoric Acid Process is used, utilizing Western phosphate rock and sulphuric acid manufactured from SO_2 gas from the zinc plant roasting operation. Complete engineering, plant design, purchasing of equipment and supervision of erection and initial operation were handled by the Dorr-Oliver organization.

Selection of Dorr-Oliver was based on over 40 years of experience in constructing wet process P_2O_5 and complete fertilizer plants throughout the world. For information on the complete range of D-O engineering services available to the Fertilizer Industry, write to Dorr-Oliver Inc., Stamford, Connecticut.



Top view of newly-developed Dorr-Oliver Single Tank Reactor used in this plant for the first time.



The entire plant operation is controlled from this central instrument panel.

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

AG CHEM Washington Report

by Donald Lerch

Industry Is Urged To Contribute More For Research

DOES the Federal Government or industry spend more on agricultural research?

If your own research budgets haven't given you the answer as yet, you can take if from Dr. Byron T. Shaw, Administrator of USDA's Agricultural Research, that industry pays the lion's share of the nation's agricultural research bill.

In testimony before the House Appropriations Subcommittee on Agriculture, Dr. Shaw disclosed that of the total $541 million expected to be spent for this purpose in fiscal 1961, industry's share will be about $280 million, or 52 percent, State contributions will be $116 million or 21 percent, and the Federal share will be $145 million, or 27 percent.

While the amount of industry research is substantial, says Dr. Shaw, he would like to see more of it. In particular, he would like to see even closer research relationships between USDA and industry. According to a survey he had made in USDA, industry now is contributing about $7.7 million in direct support to USDA research programs each year. Much of this is in the form of furnishing specialized facilities, equipment, material, and personnel.

USDA feels that industry contributions not only speed research and enable the Department to cover a wider range of research projects, but they also tend to speed adoption of research results, thus speeding agricultural progress. Industry can contribute to cooperative research in the form of funds, facilities, materials, personnel, developmental consultation, information, and data.

As of now, about $1 out of each $10 the USDA spends for production research comes from industry; about $1 of $3 USDA spends for utilization and marketing research is paid by industry.

Anyone visiting our farm lands today can see the vitality of American agriculture that has resulted from these research efforts. Agriculture Secretary Orville L. Freeman says this is "our number one success story." He urges everyone to recognize that "food is power and can be used to prove to the world what a free people can do."

Many here in Washington are coming to recognize industry's growing role in making possible this "number one success story," and suggest that greater efforts might well be exerted to make the general public aware of it, too.

While urging industry to do more agricultural research, Dr. Shaw is asking Congress for an additional $6,195,800 for USDA research in fiscal 1962; an extra $1,075,000 for disease and pest control programs; and another $2 million for payments to State Experiment Stations.

Part of these funds are to go into staffing and operating three new insect research laboratories; boll weevil research at State College, Miss.; and research on insects of corn and small grains at Tifton, Ga., and Brookings, S. D. At Mississippi State College, ARS entomologists will team up with other scientists in an all-out attack against the boll weevil, which, Dr. Shaw says, has cost cotton farmers $200 million a year for the past 50 years.

Pesticides Coordination Act

Conservation forces are expected to come out strong for passage of the "Chemical Pesticides Coordination Act" which died in the last session of Congress for lack of action. The bill has been re-introduced as H. R. 4668 and proposes to make Federal authorities consult with the U. S. Fish and Wildlife Service, U. S. Public Health Service, and state fish and wildlife agencies before conducting any mass control or eradication programs. In the last session, agricultural officials argued that this measure would hamstring many necessary pest control operations, and that, in any case, Federal authorities do consult with other affected agencies in planning their programs.

A new development, and possibly an encouraging one, is a resolution by the National Wildlife Federation urging increased research on short-lived chemicals which could be used in mass control programs "without damage to other values, including wildlife, acquatic life and public water supplies." While not going as far as recognizing that present practices cause no substantial hazard to fish and wildlife, the resolution does appear to be a step forward toward a reasonable solution.

Avoiding Residues

Moves are being made here in Washington to make the regulation of the use of farm chemicals more reasonable as well as more effective. Many of the changes are small in themselves, but they add up to major advances which should aid manufacturers as well as farmers.

One significant forward step has been the publication by USDA of a listing of all registered agricultural pesticide uses. This listing, prepared by Justus Ward, head of USDA's Pesticide Regulation Branch, gives Extension specialists and others a full listing of pesticides uses, dosages, and time limits on application in order to avoid contamination of foods. This information gets to farmers via state recommendations and via county agents.

Meantime, the Federal Food and Drug Administration has been moving ahead to avoid any repetition of the "cranberry incident" of last year. Assistant Food and Drug Commissioner Winton B. Rankin says that FDA has been making special efforts to encourage food shippers to label shipments so that they can be pinpointed at spots between the shipping point and market.

He says it was failure to locate two such shipments of cranberries, known to bear over-the-limit residues of a chemical, which caused the nation-wide publicity and the "incident." Normally, any foods which are found to bear non-permitted residues are seized and held off the market without such fanfare.

While this move will help to locate lots of foods which bear non-permitted residues, the principal method of avoiding such incidents is up to farmers. If they apply chemicals on the crops, in the dosages, and at the times recommended, they can be sure their crops are safe and seizures can be avoided.

Rankin says that FDA now has some 450 inspectors, and over half of them are working on foods. Their work is aided, however, by the work of state control agencies and USDA's Extension Service. All, he says, are seeking to maintain an abundance of wholesome foods for America's growing population.

In another move helpful in stabilizing the regulation of the use of pesticides, FDA now is tying the tolerance level to a specific method of residue analysis. If a tolerance as determined by one method is found to be safe, uses of the pesticide are not likely to need revision if a more sensitive method of analysis is found.

Sulphur Information Center

The one-year old Sulphur Institute is moving ahead with plans to develop a center for technical and scientific information relating to the agricultural use of sulphur in all its forms.

By the end of this year, or early next, you can expect the Sulphur Institute's center for technical and scientific information on the uses of sulphur in agriculture to be well underway.

The Institute is set up on an international basis to direct research on the uses of sulphur as a plant nutrient, and its use in the construction and road building industries.

In addition, the Institute is continuing its support of the Food and Agriculture Organization's program to increase fertilizer consumption in underdeveloped areas of the world. This program is part of FAO's "Freedom From Hunger" campaign, which has wide-spread support from the fertilizer industry.

Increased Interest

The pesticide industry is showing increased interest in FAO's "Freedom From Hunger" campaign. The National Agricultural Chemicals Association has been represented at conferences at FAO headquarters in Rome on the role pesticides can play in the program designed to raise the level of food supplies in emerging countries around the world.

Record Showings

The National Plant Food Institute deserves a pat on the back for the fine showing of its educational motion pictures. These films not only inform farmers and home owners on how to use fertilizer more efficiently, but, they inform non-farmers of the value of fertilizer to a healthy, productive agricultural economy.

During the school year from September 1959 to September 1960, NPFI reports that its films ran up a record of 3,705 showings and a total audience of 797,807. Most popular of their films was "Making The Most Of A Miracle" which deals with basic plant nutrition.★★

Velsicol Garden Film

Velsicol Chemical Corp., Chicago, is making available to lawn and garden supply dealers a color movie entitled "Lawn and Garden Insect Control." The film is intended to be used for group showings by dealers who wish to educate their customers to recognize lawn and garden insects, the damage they cause, and how they can be controlled.

The film, produced by Iowa State University in cooperation with velsicol, features close-up shots of a wide variety of insects as well as the damage caused by them. Prints of the 16mm sound film may be obtained for specific show dates on a free loan basis from Velsicol at 330 East Grand Ave., Chicago 11.

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Patent Granted To Hester

Jackson B. Hester, Jackson B. Hester Agricultural Research Laboratories, Elkton, Md., has been granted U. S. Patent No. 2,976,138 "Trace Element Solutions for Correcting Soil Deficiencies." The invention involves an ammoniacal solution of trace elements, which includes complex ammonium salts of the trace elements, making them readily available to plants. Dr. Hester has assigned the patent to the Suburban Propane Gas Corp., Whippany, N. J.

SYMBOLS OF PLANT LIFE

In medieval times, the "black art" of alchemy was condemned by superstitious authorities hardly less ignorant of chemistry than the masses. To avoid persecution . . . and possible execution . . . for witchcraft, alchemists invented secret symbols for use in their experiments with potash and other basic elements.

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Cleanliness is another reason. Bags of Expanda-Kraft do not create as much dust and dirt as burlap bags. In addition, they print better. They're easier to read. And finally, bugs and rodents are less troublesome with bags of Expanda-Kraft.

Keep this in mind. Expanda-Kraft is extra tough because it has two-way stretch. In fact, Expanda-Kraft has the *highest cross-direction stretch* of the leading extensible papers now on the market. It can absorb rough impacts from any direction.

H&W does not make bags. But we'll be glad to put you in touch with reliable bag manufacturers. For information and samples, write Hollingsworth & Whitney, 230 Park Avenue, New York 17, N. Y., or 111 West Washington Street, Chicago 2, Illinois.

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SCOTT PAPER COMPANY

Equipment, Supplies, Bulletins

Atlanta Batch Mixers

Atlanta Utility Works, East Point, Ga., is offering batch mixers that feature an improved discharge chute and discharge mechanism for faster, more complete discharge with less build-up and sticking. The mixers are available in sizes ranging from ½ ton to 2 tons. In addition to the improved discharge chute, the mixer flights have been revised to better handle wet, sticky mixtures and eliminate build-up and sticking in the drum. Complete information on the batch mixers is available from the company.

Webster Fertilizer Bucket

Webster Manufacturing Co., Tiffin, Ohio, has prepared a bulletin to describe its malleable iron bucket for handling fertilizer and similar materials. In test applications, the new design is said to have lasted up to three times as long as conventionally designed buckets. In addition, strength and wearing qualities are increased through the use of extra metal thickness in strategic areas although the bucket weighs less than the ordinary reinforced-back bucket.

High-Capacity Conveying

Finco, Inc., Aurora, Ill., is offering expandable conveyors that are available in sizes ranging from 6 feet to 65 feet in length, and from 6 inches to 24 inches in width. Sections can be added or removed to accommodate changing plant needs.

Because Finco conveyor-belts form natural troughs, approximately 2 inches deep, they can be used for high-capacity conveying, according to the company. A bulletin is available to describe the equipment.

Quick-Opening Closure

Bemis Bro. Bag Co., St. Louis, now is offering a quick-opening closure for sewn open-mouth and sewn valve multiwall paper shipping bags. The opening is available throughout the United States, except in certain eastern portions of the country and the West Coast where the new feature will be available within a few months.

The opening, called the Bemi-Strip, features a tab, three inches in length and three-eighths inch in width, that is placed on the factory-closed end of the bag, usually at the top. The tab serves as a point of contact for the thumb and first finger to initiate the opening of the package. A pull snaps the tab loose from the bag seam and frees the sewing thread. The bag can be opened partially, to form a filling spout, or completely, as desired.

Processing Vessel Liners

Comar Plastics, Edison, N. J., is offering custom-fabricated tank liners made of heavy vinyl sheeting for use in restoring old chemical storage and processing vessels. The liners, made from Krene vinyl sheeting, are resistant to a wide variety of acid, alkaline, and salt solutions, and some hydrocarbon systems. Krene vinyl sheeting is produced by Union Carbide Plastics Co., New York.

New Weedone Formulation

Amchem Products, Inc., Ambler, Pa., is offering a new Weedone Crabgrass Killer Liquid formulation that also will control Dallis grass and foxtail. The new formulation is said to provide increased safety for lawn grasses.

Self-Dumping Hoppers

Roura Iron Works, Inc., Detroit, is offering self-dumping hoppers that can be used to handle bulk shipments by plants regularly accustomed to handling only bagged products. The hoppers are of one cubic yard capacity and hold approximately 2,400 pounds of material. They can be moved by fork trucks and a release handle on the rear of the hopper permits the fork truck operator to dump the contents of the hopper at the unloading point. Complete details of the unit are available from the company at 1401 Woodland Ave., Detroit 11.

Diamond Soil Sterilant

Vacate, a soil sterilant for control of weeds and grasses, is being offered by Diamond Alkali Co., Cleveland, Ohio. The product not only kills existing weeds and grasses, but it suppresses regrowth of vegetation for a year or more. A non-selective heribicide, Vacate is intended for use in areas where grasses and weeds might create a fire hazard, such as rights-of-way, oil and gas storage yards, fence lines, and open storage sites.

Rodent Control Folder

The Wisconsin Alumni Research Foundation, Madison, Wisc., has distributed 20,000 sets of rodent control literature to county agricultural agents, vocational agricultural instructors, and state supervisors and health officers throughout the United States. Believed to be the largest and most inclusive mailing ever made on the subject of rat and mouse control, the literature is intended to stimulate increased interest in rodent control programs on the part of agricultural and health leaders.

Soil Insect Brochure

Velsicol Chemical Corp., Chicago, has prepared a brochure on soil insect control that lists the common soil insects that damage corn and tells how they can be controlled with Heptachlor.

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Edco Water Drill

Eynon-Dakin Co., Detroit, is offering the Edco Water Drill that, when attached to a garden hose, drills itself into soil at a rate of up to four feet per minute. It may be used to saturate roots of trees or shrubs, to make holes into which fertilizer can be placed, and to drill small diameter post holes. Constructed of aluminum tubing, the water drill is 48-inches in length.

•

Portable Plastic Greenhouse

Waco-Porter Corp., Minneapolis, Minn., is offering a portable plastic greenhouse that features a double-wall construction principle that is said to provide numerous advantages to growers. The greenhouse consists of a translucent polyethylene sleeve pulled over a curved, tubular galvanized steel frame.

Standard units now available are 5½ feet wide and either 11 or 22 feet in span. The 11-foot unit stands 3½ feet high at midpoint and covers 60 square feet of ground. The 22-foot unit stands 9 feet high and covers 121 square feet of ground.

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Baughman Liquid Spreader

Complete information on the Baughman Rapid Spread Liquid Fertilizer Spreader is available in Bulletin A-461 offered by Baughman Mfg. Co., Jerseyville, Ill. The new spreader operates on compressed air and discharge is in the form of solid droplets, rather than mist spray.

The Rapid Spread is designed for mounting on a regular flat bed truck or wagon. Standard units weigh approximately 1,380 pounds and hold 1,000 gallons of liquid.

Hi-Speed Richardson Bagger

Richardson Scale Co., Clifton, N. J., is offering a scale that features a new device that speeds up beam response and leads to faster feed cutoff. The scale, called SPEEDAC, E-50, weighs up to 24 50-pound bags of free-flowing materials per minute.

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Diamond Water Herbicide

Diamond Alkali Co., Cleveland, is introducing a granular herbicide for the destruction of water weeds. Known as Crop Rider 20% Aqua Granular, the product is formulated to rid ponds, lakes, and ditches of plants. It has been used in lakes with results that are reported to have been excellent and without harmful effect on fish.

Application can be made from a raft or boat by attaching a fertilizer-type spreader to the end of the boat. Other methods recommended by Diamond are whirlplate type of seeder, broadcasting by hand, or spreading by helicopter.

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Arcadian® News

Volume 6 Nitrogen Division, Allied Chemical Corporation Number 6

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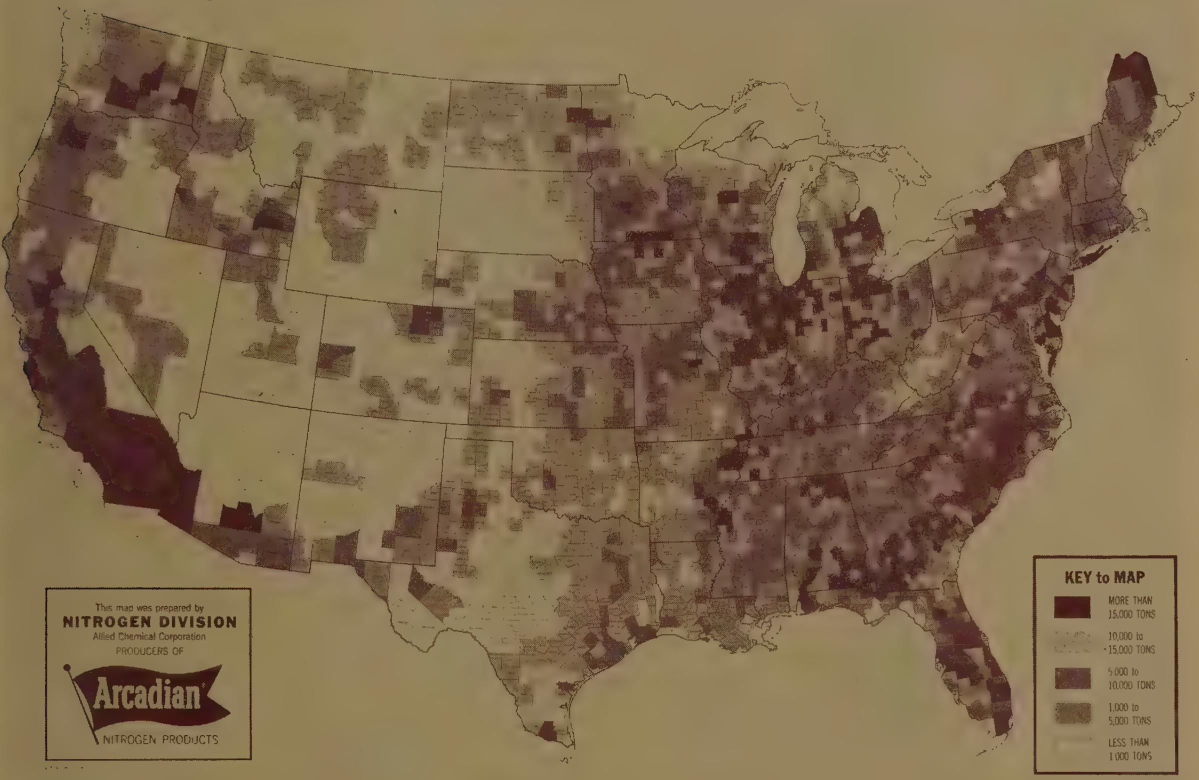

USE OF COMMERCIAL FERTILIZERS BY FARMERS

Based on county data compiled by Nitrogen Division, Allied Chemical Corporation, from U. S. Census of Agriculture, 1959.

This is a miniature reproduction of a big map, 28 inches long and 21 inches deep, lithographed in five colors, which you can obtain without charge from the ARCADIAN News. Just use the coupon on the next page. Based on 1959 U. S. Census of Agriculture figures, this map shows the relative importance of each county in 48 states as a market for commercial fertilizers. On the map, counties that use more than 15,000 tons of commercial fertilizers are shown in red; 10,000 to 15,000 tons, in

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yellow; 5,000 to 10,000 tons, in green; 1,000 to 5,000 tons, in blue; less than 1,000 tons, in white. This map is ideal for quick reference. It shows you, at a glance, the exact location of the best fertilizer markets. You will use it many times in many ways. Only a limited number of these maps are available. To obtain your free copy, we suggest that you fill out and mail the coupon below today!

State Tables Also Available

In addition to the map, ARCADIAN News has also prepared an individual state table for each of 48 states, similar to those shown at right for Illinois and Indiana. Based on census figures, these tables give the following data for each state:

- **Total farms in state.**
- **Farms using fertilizer.**
- **Total tons of fertilizer.**

Each table also gives the following data for each major crop grown in the particular state:

- **Acres fertilized.**
- **Tons dry material used.**
- **Tons liquid material used.**

You can obtain individual state tables containing all of this information for the states in which you are interested, simply by mailing the coupon below. There will be a big demand for these tables and supplies are limited. We therefore suggest that you mail your coupon today. ARCADIAN News has compiled and reproduced this information as a service to the fertilizer industry and there is no charge for this service.

ILLINOIS

TOTAL FARMS IN STATE 154,640
FARMS USING FERTILIZER 107,632
TOTAL TONS OF FERTILIZER . . . 1,219,329

CROP	Acres Fertilized	Tons Dry Material	Tons Liquid Material
CORN	6,483,003	677,542	143,481
WHEAT	1,255,233	147,045	15,171
SOYBEANS	489,998	55,984	1,754
HAY & CROPLAND PASTURE	318,789	76,013	2,156
All Other Crops Including Non-Cropland Pasture	532,075	97,262	2,921
TOTAL ALL CROPS	9,079,098	1,053,846	165,483

INDIANA

TOTAL FARMS IN STATE 128,160
FARMS USING FERTILIZER 102,416
TOTAL TONS OF FERTILIZER . . . 1,005,600

CROP	Acres Fertilized	Tons Dry Material	Tons Liquid Material
CORN	4,839,631	581,559	58,415
WHEAT	1,163,838	140,987	6,182
SOYBEANS	823,685	63,284	1,437
HAY & CROPLAND PASTURE	302,942	40,451	1,284
All Other Crops Including Non-Cropland Pasture	890,769	108,103	3,898
TOTAL ALL CROPS	8,020,865	934,384	71,216

CLIP and MAIL this COUPON to get your map and tables promptly!

ARCADIAN News, Nitrogen Division, Allied Chemical Corporation, 40 Rector St., New York 6, N. Y.

Without charge, send me the big 5-color map showing use of fertilizers in every county of 48 states. Also send me fertilizer data tables for the states I have checked below.

☐ Alabama
☐ Arizona
☐ Arkansas
☐ California
☐ Colorado
☐ Connecticut
☐ Delaware
☐ Florida
☐ Georgia
☐ Idaho
☐ Illinois
☐ Indiana
☐ Iowa
☐ Kansas
☐ Kentucky
☐ Louisiana
☐ Maine
☐ Maryland
☐ Massachusetts
☐ Michigan
☐ Minnesota
☐ Mississippi
☐ Missouri
☐ Montana
☐ Nebraska
☐ Nevada
☐ New Hampshire
☐ New Jersey
☐ New Mexico
☐ New York
☐ North Carolina
☐ North Dakota
☐ Ohio
☐ Oklahoma
☐ Oregon
☐ Pennsylvania
☐ Rhode Island
☐ South Carolina
☐ South Dakota
☐ Tennessee
☐ Texas
☐ Utah
☐ Vermont
☐ Virginia
☐ Washington
☐ Wisconsin
☐ Wyoming
☐ West Virginia

Your Name:____________________ Name of Firm:____________________

Address:____

Arcadian News *for Fertilizer Manufacturers from* **Nitrogen Division, Allied Chemical**

Precautions for Handling Solutions in Hot Weather

Fertilizer plant operators who ignore the effect of heat on the physical properties of ammoniating solutions are liable to be in "hot water" in hot weather. The most efficient operators keep one eye on vapor pressure curves and the other eye on the thermometer, so they can handle nitrogen solutions properly when the temperature goes up.

In the summer, the vapor pressure of solutions is a matter of serious concern from the moment of arrival of the tank car at the plant until the ammonia in the solutions has been neutralized by superphosphate or acid in the mixer.

Two Pressures

Two pressures are involved in hot weather handling—the vapor pressure of the solution and the air pressure that is required to move the solution through the equipment. Both of these pressures tend to increase in warm weather, and all equipment must be able to withstand the extra pressure. Gauges and safety devices must be in good working condition. The hose from the tank car should be securely connected to ample fittings with heavy metal clamps having *four* large bolts each. *(Make certain that all pressure is released before disconnecting hose. This is particularly important when quick-acting couplings are used.)*

Importance of Air Pressure

Most vapor-pressure, warm-weather problems can be overcome by maintaining enough *air pressure* to keep the ammonia in solution at all points in the system where gas formation can cause trouble. *Always keep the air pressure higher than the vapor pressure.*

In the Tank Car

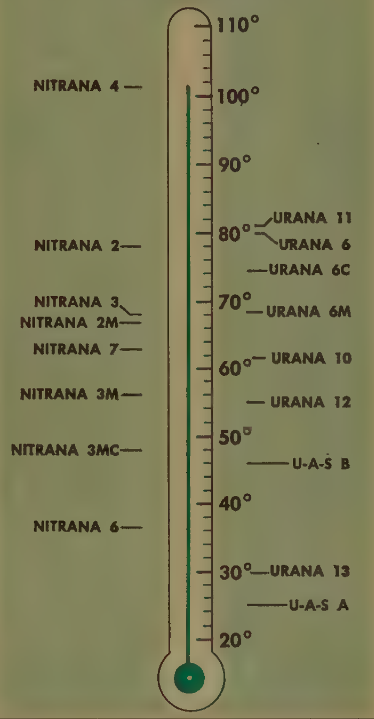
Insufficient air pressure in the tank car can permit the rush of enough ammonia gas through the hose to make the operator believe that the car is empty. If there is much back-pressure from hot storage tanks, measuring tanks or pipelines, it may be impossible to move any nitrogen solution from the car until the back-pressure is relieved or the pressure in the car is built up with air. Incidentally, pressure cannot be gauged accurately at any point while a fluid is moving rapidly past that point in the system.

At the Pump

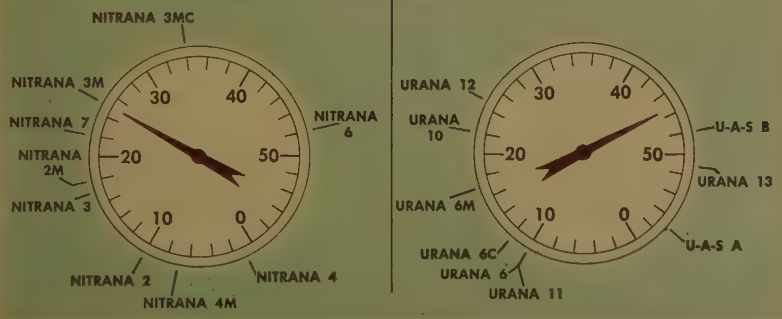
At the suction side of the pump, where the relative vacuum has the same power as increased temperature to release ammonia gas, even a small amount of gas will vapor-lock almost any pump. Leakage of air into the suction line will also vapor-lock pumps. Centrifugal pumps can often be made to function by throttling down the discharge volume from the pump enough to reduce the pull on the suction side. But this procedure is of little help in positive-displacement pumps, such as gear and piston pumps, since they deliver about equal volumes of liquid at all discharge pressures. Furthermore, these pumps may be damaged by excessive pressures.

Trouble at the pump is sometimes caused by hot suction lines. These lines may be cooled with water, or cooled by allowing some ammonia to vaporize through the stopped or slowly turning pump so as to refrigerate the metal. White or aluminum paint on piping and tanks reflects the sun's rays to reduce heating.

APPROXIMATE BOILING POINTS
DEGREE FAHRENHEIT
ARCADIAN AMMONIATING SOLUTIONS
AT 0 LBS. GAUGE PRESSURE
(ATMOSPHERE PRESSURE)



VAPOR PRESSURES
AT 104° FAHRENHEIT—POUNDS PER SQ. IN. GAUGE
ARCADIAN NITROGEN SOLUTIONS



At the Volume Meter

In volumetric meters and measuring tanks, the solution will weigh less per gallon if it develops many bubbles due to low pressure. The bubbles can be so microscopic that they escape attention. Sometimes the bubbles are moving actively enough to make it impossible to read the level of the solution in gauge glasses or glass rotameter tubes. Adequate air pressure will correct this condition. Even when ammoniating solutions are in 100 per cent liquid state while being measured volumetrically, they average one per cent lighter weight per gallon for each 25 degrees F. increase above the standard measuring temperature of 60 degrees F. The exact data on temperature-weight relationships for all ARCADIAN Nitrogen Solutions are available on request from Nitrogen Division, Allied Chemical Cor-

"ARCADIAN", "NITRANA", "URANA" and "U-A-S" are trade-marks of Allied Chemical Corporation.

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poration. The specific gravity or weight of anhydrous ammonia decreases still faster with an increase in temperature—about one per cent for each six degrees F. increase in temperature.

In Tanks and Pipes

All these liquids generate high pressures when they are trapped within tanks 100 per cent full of liquid, or in pipe lines between two closed valves. Ample vapor space must be allowed in all tanks. This takes a considerable amount of head space for anhydrous ammonia.

In the Mixer

In the distributor pipe inside the fertilizer mixer, the heat may be so great that special techniques must be invoked for coping with large amounts of ammonia gas. For specific help on this problem, see your Nitrogen Division, Allied Chemical, technical service representative.

Hot weather troubles with any ammoniating solution may start when the temperature of the solution reaches the boiling point at atmospheric pressure. This is a lower temperature than you would normally expect trouble, but it usually develops when you are using a pump located beneath the supply tank. If enough air pressure is added, it will prevent volatilization of ammonia gas at the critical points. As shown in the table, the boiling points of some ARCADIAN Nitrogen Solutions at atmospheric pressure, and their vapor pressures at 90 degrees F. and at 104 degrees F., show a need for alertness in handling.

Vapor Pressure Changes

At increased temperature, an ammoniating solution takes on the vapor pressure properties of a more volatile solution. For instance, at 90 degrees F., NITRANA 2 develops a vapor pressure of only 4 pounds, so that handling is easy. But at 104 degrees F., its vapor pressure of 10 pounds is about the same as that for NITRANA 2M, NITRANA 3 and URANA 6M at 90 degrees F. Warm weather always requires extra attention in moving solutions.

For example, at 100 degrees F. atmospheric temperature, the contents of an 8,000-gallon uninsulated tank car loaded with NITRANA 2 develops the following temperature and pressure:

Maximum daily high pressure: 29.3 pounds at gauge
Average daily high pressure: 13 pounds
Liquid temperature at the top level in the tank car: 108 degrees F.
Liquid temperature in the middle of the tank car: 86 degrees F.
Liquid temperature at the bottom of the tank car: 81 degrees F.
Vapor temperature at the top of the solution: 131 degrees F.

Judging from the published pressure-temperature relationship, you might expect that 100 degrees F. temperature would build up only 8 pounds of pressure. The additional 5 pounds at average high pressure, and 21 pounds at maximum pressure, could cause trouble for an unwary operator.

Other spots where it may be hotter than you expect are in pipelines exposed to the sun, near metal siding in the sun, near dryers, in or near the hot mixer, or almost anywhere in a warm building.

Changing Solutions

In summer, many fertilizer producers change to a nitrogen solution which has a lower vapor pressure to avoid problems. You have a wide choice in the big line of ARCADIAN Nitrogen Solutions to meet the most exacting requirements. However, if you choose to use your winter solution, you may continue using it by making a few simple changes in equipment and operation. For instance, you can insulate your pipelines and improve the ease of operation both in hot weather and in cold weather.

You can get help in choosing the right ARCADIAN Nitrogen Solution by asking your Nitrogen Division technical service representative. Summer or winter, you can realize maximum benefits in fertilizer manufacture by picking the right solution for every situation. For technical advice and assistance, contact Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N. Y.

GREEN FIELDS CAN BE SALES MAKERS

Green fields speak as loud as big yields to many farmers. When the corn leaves lap in the row, the oats are shoulder-high, and the pasture is knee-high to cows, any farmer loves to show off his crops. That's a good time to go and see him, if he uses your fertilizer. It's also a good time to show his crops to other farmers.

One farmer applied a double dose of fertilizer to his corn by mistake. He made a big profit on the extra tonnage of silage produced by the extra fertilizer. But he didn't tell his neighbors about yields and profits. He told them how tall and green his corn grew during a dry season. He knew he made money from fertilizer. This was dramatized to him by the lush, green crop right before his eyes all summer.

It will pay you to take advantage of a farmer's pride in a good crop grown with your fertilizer. He can be an excellent salesman and demonstrator for you. Farm calls, when crops are green and growing, can produce plenty of success stories. The best way to tell these success stories is to take other farmers to see them. This enthusiasm sells fertilizer.

BEST N FOR YOUR N-P-K

Arcadian

NITROGEN

There are many reasons why it pays you to use ARCADIAN® Nitrogen Products in the manufacture of your mixed fertilizers. Here are only a few:

You are served by the leading producer of the most complete line of nitrogen products on the market. You have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You get formulation assistance and manufacturing advice from the best-qualified technical service staff in the industry. You benefit from millions of tons of nitrogen experience and the enterprising research that originated nitrogen solutions. You get many important bonus values when you make ARCADIAN Nitrogen the N in your N-P-K.

ARCADIAN
Nitrogen Products

NITRANA® Nitrogen Solutions
URANA® Nitrogen Solutions
DURANA® Nitrogen Solutions
U-A-S® Nitrogen Solutions
N-dure® Solution
A-N-L® Nitrogen Fertilizer
Ammonium Nitrate
UREA 45 Nitrogen Fertilizer
Sulphate of Ammonia
American Nitrate of Soda

Allied Chemical

NITROGEN DIVISION
MAIN OFFICE: 40 Rector St., New York 6, N. Y.

NEWS ABOUT THE AG CHEM TRADE

Hovey Fills New Position

C. L. Hovey

D. H. Marsden

Chas. L. Hovey (left), previously head of agricultural chemicals research at Eastern States Farmers' Exchange, West Springfield, Mass., has been advanced to manager of one of eight newly-created field areas. In this new position Mr. Hovey directs all Eastern States activities within Connecticut and western Massachusetts. His headquarters are in West Springfield.

David H. Marsden, previously associated with Mr. Hovey, has been promoted to head of the Eastern States agricultural chemicals research department. Prior to joining Eastern States in 1954, he had been plant pathologist at the Shade Tree Laboratories, University of Massachusetts.

•

Round Table Lists Theme

Materials handling will be the theme of the Fertilizer Industry Round Table to be held November 8 to 10 at the Mayflower Hotel in Washington, D. C. The program for the meeting is being developed around a group of semi-informal papers dealing with the theme and two question and answer sessions.

The materials handling theme has been divided, for purposes of the Round Table, into four categories. They are unloading, storage, shipping, and in-plant handling. Round Table members have been invited to submit questions for discussion.

•

Pratt Joins IFD Corp.

Christopher J. Pratt has been appointed vice president in charge of operations by International Fertilizer Development Corp., an affiliate of International Ore & Fertilizer Corp., New York. He had been with Ebasco Services, New York, and Dorr-Oliver, Inc., Stamford, Conn. Mr. Pratt is a co-author with Dr. Vincent Sauchelli of "Chemistry and Technology of Fertilizers."

•

Ribicoff To Address NAC

Abraham A. Ribicoff, Secretary of Health, Education, and Welfare, will be the featured speaker at the annual banquet of the National Agricultural Chemicals Association during the group's 28th annual meeting at the Homestead in Hot Springs, Va., Oct. 29 through November 1.

•

Analytical Workshop

A workshop on new methods for determining phosphorus in fertilizers will be held July 6 to 8 at Purdue University, Lafayette, Indiana. The workshop is being co-sponsored by the Association of American Fertilizer Control Officials, the Association of Official Agricultural Chemists, and the National Plant Food Institute.

In addition to group laboratory work, the workshop will feature discussions of principles and details concerning quinolinium method, gravimetric procedure, volumetric procedure, photometric method of analysis.

•

Pesticide Hazards Report

The California Department of Public Health has prepared a report concerning occupational diseases in California attributed to pesticides. The report states that there has been a steady increase in the number of disease reports despite a decrease in the agricultural labor force.

William Caspari Retires

W. Caspari

W. M. Rohrer

William Caspari Jr., general sales manager, agricultural chemicals, of W. R. Grace & Co., Davison Chemical Div., Baltimore, Md., retired May 31 after 44 years of service with Davison, the only company for which he ever had worked. He will continue with the Company in a consulting capacity.

In 1915 he joined the Davison Chemical Co., working in the chemistry laboratory. In 1919 Davison sent him to Cuba in charge of the company's railroad and pier loading facilities.

Mr. Caspari in 1929 was returned to Baltimore in wholesale sales for Davison and was instrumental in the organization of Davison's export department and has traveled extensively in Latin America, Canada and Europe, as well as the United States, for the department.

William M. Rohrer has been named to succeed Mr. Caspari as general sales manager, agricultural chemicals. Mr. Rohrer, who has been with Grace for 14 years, had been assistant general sales manager.

•

Cyanamid Plans Increase

The American Cyanamid Co., New York, plans to increase production capacity of phosphate fertilizer at its Brewster, Fla., plant. The expansion will provide facilities for producing 200,00 tons per year of granular triple superphosphate fertilizer.

In addition, a new coarse triple superphosphate and an increased supply of run-of-pile material will be available. The new production capacity is part of Cyanamid's long-term program of expansion.

Production utilizing the new installations is expected to begin early next year.

Fertilizer Outlook For '61 Dim Despite Early Optimism

DESPITE earlier optimistic predictions, late reports indicate that the fertilizer industry currently is feeling the ill effects of excessive rains, and the revised farm program. The outlook appears to be that, unless there is some improvement in weather conditions in another few weeks, the year's tonnage may not reach that of last season.

Heavy fertilizer shipments during March supported the early feeling of optimism but there was a noticeable drop in tonnage in April, particularly in the corn belt, where farmers, spurred on by inclement weather, have been retiring more feed grain acreage under the Emergency Feed Grain Program.

Corn takes about the highest percentage of fertilizer for any single crop, but a general drop in consumption for other crops is feared because of excessive moisture, particularly in the midwest, south and northeastern states.

Figures released during May revealed that more than 12 million acres have been diverted from corn and grain sorghum plantings under the 1961 farm program. This acreage is located on 55,623 farms that averaged nearly 30 million acres of corn and grain sorghum plantings during 1959-60.

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Universal Bucket Elevators are engineered and designed to meet the specific needs in your plant, available for capacities up to 3,750 cubic feet per hour at any exact height. Available in standard steel, galvanized or stainless. Universal elevators wear longer and elevate your materials efficiently and smoothly.

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Universal's "TROF-BELT" conveyor is a low cost, trouble-free method of moving all free flowing materials in capacities up to 3,750 cubic feet per hour. Less maintenance and dependable, efficient performance are made possible by a smooth, rollerless design.

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●

Additive Reactivates DDT

An additive that reactivates DDT was discovered by Dr. Moshe Neeman in Israel and has been developed by the Wisconsin Alumni Research Foundation. The additive is *N*,*N*-di-*N*-butyl-*p*-chlorobenzenesulfonamide. WARF finds that after 18 generations, flies still are susceptible to conventional dosages of additive-DDT combinations. The additive prevents insects from turning DDT into noninsecticidal DDE by use of an enzyme, dehydrochlorinase.

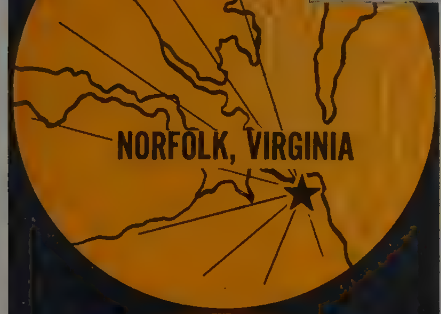
A second enzyme that inactivates DDT in insects has been found at the University of California, Berkeley. The enzyme converts DDT to a harmless Kelthane-like product, called metabolite No. 4, through a process of oxidation.

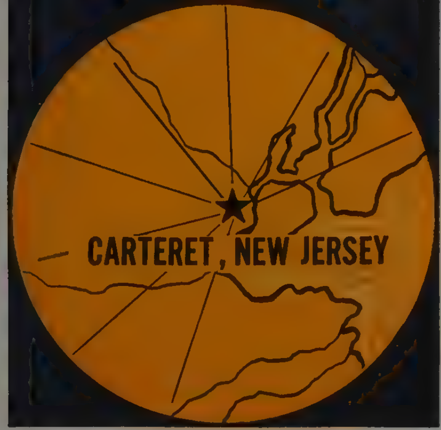
●

Potash Deliveries Higher

Deliveries of potash for agricultural purposes in the United States, Canada, Cuba, and Puerto Rico by the eight principal American producers and also the importers totaled 1,115,911 tons of salts containing an equivalent of 647,764 tons of K_2O during the first three months of 1961.

Excluding imports, this was an increase of 10 per cent in salts and K_2O over the same period in 1960. Continental United States took 607,799 tons K_2O, Canada, 25,236 tons, Cuba, no tons, Puerto Rico, 10,108 tons, and Hawaii, 4,621 tons K_2O. Exports to other countries were 97,915 tons K_2O, a decrease of 19 per cent.





molten sulphur

SHORT HAULS–PROMPT DELIVERIES

Beaumont, Texas is the shipping point for practically all the TGS tonnage of molten sulphur sent to the eastern half of the United States. *BUT* instead of waiting for deliveries measured in days TGS customers can rely upon these four regional terminals and get their supplies in much faster time.

Cincinnati, Ohio	**Tampa, Florida**
Norfolk, Virginia	**Carteret, New Jersey**

At each of these terminals, we maintain inventories of thousands of tons of molten sulphur, ready for prompt deliveries by tank car and tank truck. It would be an unusual demand that would necessitate time-consuming 'Beaumont to customer' delivery.

This is service with a capital S. These terminals are part of a steadily expanding TGS program of shortening Sulphur supply lines.

TEXAS GULF SULPHUR COMPANY
75 East 45th Street, New York 17, N. Y.
811 Rusk Avenue, Houston 2, Texas

Sulphur Producing Units: Newgulf, Texas • Moss Bluff, Texas • Fannett, Texas • Spindletop, Texas • Worland, Wyoming • Okotoks, Alberta, Canada

Diamond Herbicide Comics

Diamond Alkali Co., Cleveland, Ohio, has prepared a 16-page, full color cartoon booklet to dramatize Diamond's three brand name herbicides, Crop Rider, Fence Rider, and Line Rider.

The booklet, designed primarily for children between 8 and 12 years of age, uses a western approach to tell the story of herbicides. The plot is woven around three deputies (Crop Rider, Fence Rider, and Line Rider) who rid the town of Pleasantville of such desperadoes as the ragweed gang, the bramble brothers, and Wild Cherry Charlie.

•

Michigan State Field Day

The annual Crops-Soils Field Day at Michigan State University farms in East Lansing will be held June 29. Tractor-drawn trailers will take visitors to tour stops where research personnel will explain such activities as fertilizer placement experiments, chemical weed control and soil testing.

•

$96 Million Lost To Borers

The European corn borer last year destroyed an estimated 102,991,000 bushels of corn worth $96,085,000, according to figures released last month by the U. S. Department of Agriculture. The loss, a composite of state and USDA estimates, nearly equals Wisconsin's entire 1960 crop, and is about 2.6 per cent of the total U. S. crop. It was 52 per cent greater than in 1959, and is the fourth largest bushel loss in the past 10 years attributed to borers.

Swiss Pesticide Industry Is Well Established

Of the 16 firms in the Swiss pesticide industry, the two most prominent are Dr. R. Maag AG., Dielsdorf, and J. R. Geigy AG., Basel, followed by Sandoz AG., Basel, and Siegfried AG., Zofingen. Geigy had a very good year in 1960 with Simazine. Maag's best seller was Cuprosan, a fungicide used in vineyards against mildew.

Ciba, the largest Swiss chemical producer, several years ago purchased a small pesticide manufacturing company but it has not taken the lead in pesticide sales. The Shell Oil Co., Zurich, a relative newcomer, has launched an extensive advertising campaign to capture a share of the market, according to a report prepared by A. Lombardi of the American Consulate in Zurich.

The Swiss pesticide industry is financially strong and is well-equipped with modern research laboratories and testing stations. Switzerland, however, lacks natural resources and must import all pesticide raw materials. The U. S. is a major supplier of organic fungicides such as Captan, Glyodin, Karathane, Maneb, and Phalthan. Benzene is supplied largely by the domestic market.

Swiss farmers spent $5.6 million, estimated at about $3.9 million at the manufacturers' level, for pesticide products in 1959; 3.5 per cent more than in 1958. In terms of quantity, however, consumption decreased from 5,890 to 5,460 metric tons, probably as a result of the trend toward use of newly-developed, specialized preparations in place of those formerly consumed.

Data on exports and imports of pesticides are not available, but it can be assumed that at least 50 per cent of total production is exported, principally in the form of active ingredients.

The outlook for the Swiss pesticide industry is a healthy one. Domestic producers are well established and, although there are no special government or private programs to increase consumption, demand is steady. Possibilities for increased U. S. exports to Switzerland principally are in technical pesticides and, to a lesser degree, in formulated materials. Domestic manufacturers supply the relatively small quantities of finished goods.

Expands Marketing Program

Spencer Chemical Co., Kansas City, Mo., has expanded its program to market Spencer products on a world-wide basis and to seek foreign investment opportunities. Spencer Chemical International has taken complete charge of the parent company's overseas operations.

•

Stabilized Methyl Parathion

Victor Chemical Works, division of Stauffer Chemical Co., Chicago, is offering a new, stabilized form of methyl parathion. The product is being introduced on a national basis under the trade name Stabilized T-80 methyl parathion.

•

Duval Sees Normal Year

Earnings and revenues of Duval Sulphur & Potash Co., Houston, are not expected to reach the "abnormally high" levels of 1960, according to W. P. Morris, president of the company.

Export shipments of sulphur this year will about equal exports in 1960, Mr. Morris said, while domestic shipments will drop somewhat because of a "highly competitive" sales situation. He said that the company expects potash and molybdenum sales to be "generally good," but revenues from copper are expected to drop.

The company's second potash ore body at Carlsbad, N. M., currently is starting production. The facility is located 13 miles from Duval's existing plant. Mr. Morris said that it is too early to tell whether the potash industry will follow the American Potash & Chemical Corp. in boosting potash prices.

•

Foreign Pest Found

A major European plant pest, *Melolontha melolontha,* had been found on airplanes arriving from Paris at airports in the United States last month. The reddish-brown beetle belongs to the same family as the Japanese beetle and the European chafer.

OFFICE OF THE VICE PRESIDENT

INTEROFFICE CORRESPONDENCE

TO: all department heads

FROM: L. W. Gopp, vice president

We've just closed the books on another fine fiscal year. This last twelve-month period has been one of our most successful to date and we've been unusually fortunate in signing additional new contracts.

More than ever I feel that the continued growth of our business reflects confidence in our people and in our products and services by an imposing list of customers. I feel, also, it is our individual responsibility -- at every level of the corporation -- to show, in an active way, our appreciation for this business. I encourage you to continue to look for new and improved ways to extend still further the IMC concept of total service.

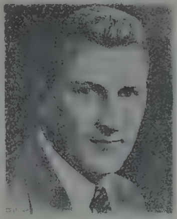
Len Gopp

Len Gopp

AGRICULTURAL CHEMICALS DIVISION
INTERNATIONAL MINERALS & CHEMICAL CORPORATION
IMC

Heads Michigan Sales

Fred Dolton has been named manager of national account sales for the Michigan line of bulk handling machinery by the Construction Machinery Division of Clark Equipment Co., Buchanan, Michigan. His headquarters are in New York. Prior to this assignment, Mr. Dolton had been national account sales representative for the Construction Machinery Division.



Olin To Move To N. Y.

Olin Mathieson Chemical Corp., plans to move the headquarters of its chemicals division from Baltimore to New York. Almost 700 persons are employed in the division headquarters, which now occupies parts of nine floors of the Mathieson Building in Baltimore. The corporation's Baltimore manufacturing operations will not be affected.

The offices being transferred to New York generally are the same ones moved to Baltimore from New York in 1949. All six of Olin's other divisions already have headquarters in New York. The move will be made this summer.

Niagara Shifts Johnston

Dr. Titus Johnston has joined the field research staff of Niagara Chemical Division of Food Machinery and Chemical Corp. at Jackson, Miss. He had been in charge of Niagara's pathology laboratory at Middleport, N. Y.

Pyrethrum Future Bright

Pyrethrum sales, which should hit $7 million this year, could more than double that total in 1965, reaching nearly $15 million, according to a report contained in the April 24 issue of *Oil, Paint and Drug Reporter*. Five general factors are believed to be involved in the resurgence of pyrethrum, which has been fairly steady in sales until recently.

Pyrethrum is relatively harmless to humans and other warmblooded animals; it is readily available; insects do not develop resistance to it; it is ideal for use by the increasing number of home gardeners; and the insecticide business as a whole has grown.

Pyrethrum's high cost, however, ($55 per pound) is regarded as its key drawback for large-scale farm use. Volume users also are interested in residual effect, for which pyrethrum is not noted.

Considerably more than 90 per cent of the pyrethrum in U. S. insecticides comes from Kenya, with small amounts coming from Tanganyika and central Africa. The unstable conditions in Africa, however, have caused the pyrethrum industry to consider Ecuador, Brazil, and Peru as safety valves. There now is an extraction plant in Ecuador and one in Brazil. Within four or five years, it is expected that a plant will be built in Peru.

CACA To Meet Sept. 18 to 20

The 9th annual meeting and conference of the Canadian Agricultural Chemicals Association will be held at Mont Tremblant Lodge, Mont Tremblant, Quebec, September 18 to 20. A tentative list of speakers includes Dr. Rosemarie von Rumker of Chemagro Corp., who will discuss "Agricultural Chemicals, Research and Development Policy."

In addition, a senior economist in the field of agricultural trade will discuss the economics of future Canadian agricultural exports. A panel consisting of senior officers of some Eastern Provincial Departments of Agriculture also is planned and will cover such topics as extension, marketing, spray calendar, testing, and cooperation between industry and government.

Fertilizer Cost To Play Dominant Role In Future

WHICHEVER segment of the chemical industry can put plant food "on the field" at the lowest cost "will dominate the future," M. D. Sanders, Agricultural Chemical Division, Swift & Co., Chicago, told a joint meeting of the American Institute of Chemical Engineers and the Chemical Engineering Division of the Chemical Institute of Canada, May 9, in Cleveland, Ohio.

Up to now, Mr. Sanders pointed out, the chemical plant food industry has consisted of two major divisions: the producers of the basic materials, ammonia, phosphates, and potash salts, and the mixers and granulators of complete NPK plant foods who buy all their raw materials from the basic producers. Recently, however, he added, "three additional routes from basic producers to the consumer have made their appearance."

He listed these routes as: 1. Some producers of phosphates also have become basic in nitrogen, resulting in the marketing of ammonium phosphates directly to consumers as well as to mixers and granulators. 2. Some producers of nitrogen have gone the "nitrophosphate route" to complete NPK plant foods, and 3. Innumerable small, highly localized operations now are formulating liquids from phosphoric acid, ammonia, and soluble salts, or are dry mixing granulated and sized nitrogen phosphate and potash materials to grade or to prescription, often coupled with an application service.

"Which of the four methods of serving the consumer will dominate the future, in the last analysis, depends on the final cost of the plant food as applied in the furrow or on the field," he said. "Lower cost per ton of plant food in large, integrated plants may be counterbalanced by higher average freight rates to the consuming areas," he added.

"We, therefore," Mr. Sanders concluded, "may see one route from primary producer to consumer dominate in one area, and lag behind in another, depending on the logistics of phosphate rock, sulfur, natural gas, and potash salts."

To Expand Sulphur Research

The one-year-old Sulphur Institute will put its research and educational program, dealing with new and expanded uses for sulphur in all its forms in industry and agriculture, into full operation during 1961-62.

Although some research was begun during the current year, the 1961-62 budget for the institute provides for a variety of projects to be conducted by public and private research organizations in many parts of the world. With regard to agriculture, the studies will deal primarily with the use of sulphur as a plant nutrient. A number of projects are slated to assess the sulphur needs of soils in various areas of the world, including Europe, the United States, South America, Australia, and India. Other investigations will have as their aim the development of suitable soil and tissue tests to help predict sulphur needs of crops.

•

To Increase Capacity

United States Borax & Chemical Corp., Los Angeles, will begin construction this month to increase the capacity of certain production units at its Boron, California, installation. The project will raise production of both primary and specialized borax products.

•

Added Uses Cleared

Systox, Chemagro's systemic insecticide, has been registered in the U. S. for use on apricots, plums, and prunes to control aphids and mites, and on peppers to control aphids. In another move, the USDA cleared Sevin insecticide for use to control tobacco insects. Sevin is a product of Union Carbide.

•

To Operate Independently

Pacific Guano Co., Los Angeles, formerly controlled by a Hawaiian firm, will be operated as an independent agricultural chemical marketing organization, according to the company's new owner, Collier Carbon and Chemical Corp., Los Angeles.

Pacific Guano markets a complete line of fertilizers, insecticides, and herbicides under the Gaviota and Gavicide brand names throughout California, Arizona, and Nevada. Wiliam H. Foster has been named president of the company.

•

Hurlimann Joins Geigy

Conrad G. Hurlimann has joined Geigy Chemical Corp. as vice president and director. He had been with Pfizer International, Inc.

•

Heads Deere Research

Dr. L. E. Craig has been named to the newly-created post of director of research and technical service for John Deere Chemical Co., Pryor, Oklahoma. He is in charge of all phases of research and technical services for both the Pryor and Tulsa plants of John Deere.

Dr. Craig has been with Deere & Co.'s chemical division, formerly Grand River Chemical Division since early 1954. He has been director of research since 1956.

•

Cyanamid Corn Herbicide

A new liquid herbicide for quackgrass control is being offered by American Cyanamid Co., New York, this season to corn growers in the northern United States. The product is being marketed under the tradename of "Cytrol" and has been tested extensively in the northeast and midwest. The major ingredient in Cytrol is amitrol.

•

Niagara Names Two

Nelson Darroch has been named technical assistant to the production manager at the headquarters plant of Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, N. Y. He has been with Niagara since 1958 and had been chief chemist in quality control. Richard R. Heinze has been named to replace Mr. Darroch in that position.

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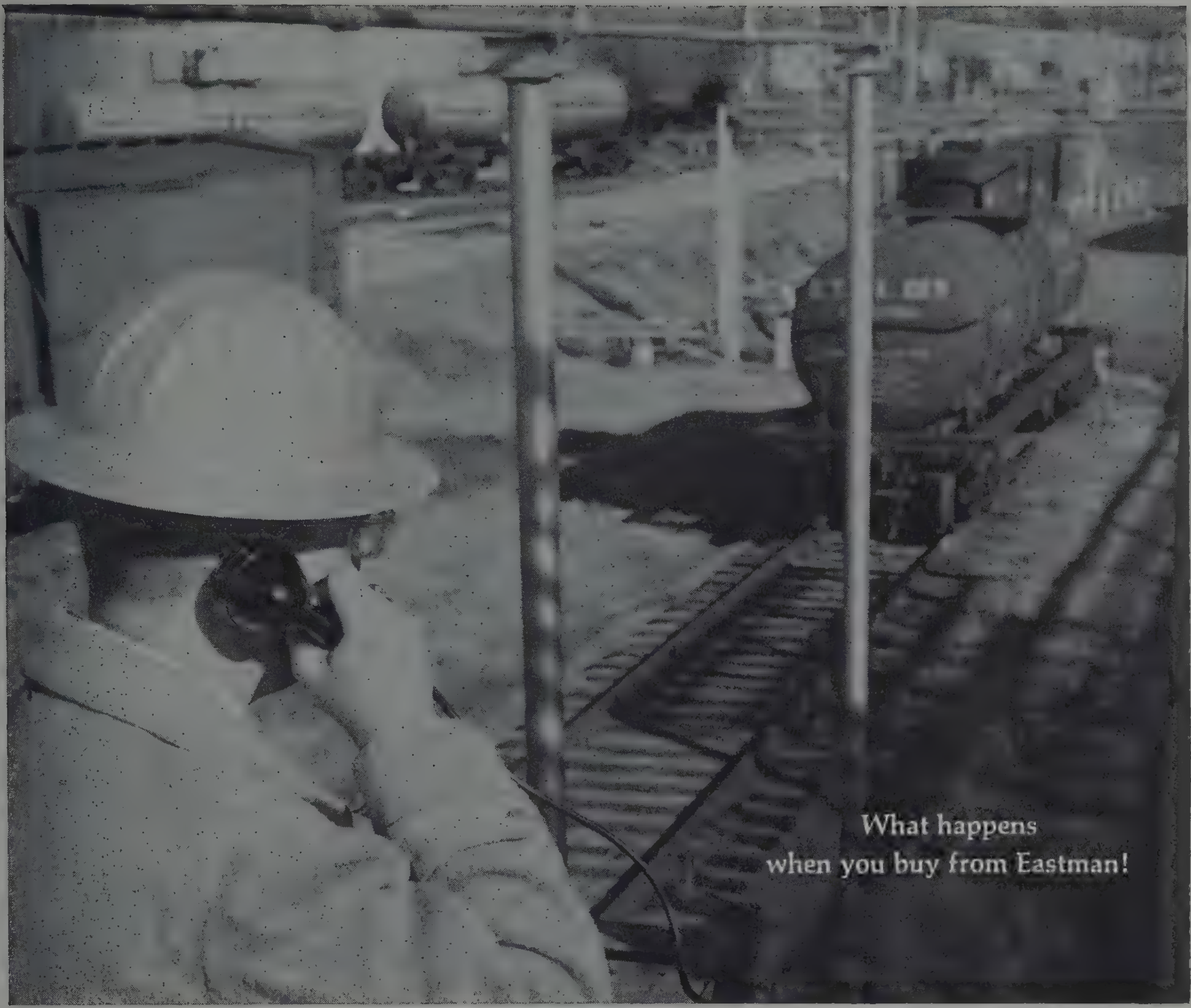
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Long distance unloading

"I guess I've personally unloaded or supervised the unloading of better than 20,000 tank cars," said our materials handling supervisor, "but this was the first time I ever tried to unload one by long distance telephone.

"The plant manager who called was considerably embarrassed by the whole situation. He runs a small, efficient processing plant and is a good customer of ours for Tecmangam® (manganese sulfate), which he uses in his line of feed supplements. But the particular material he wanted to unload was not Tecmangam. In fact it did not even originate at our plant. It came from another supplier whom he had been unable to reach by telephone.

"The situation was further complicated by the fact that not only was his unloading foreman off sick but this was the first time they had ever received this particular material. He said he did have a fresh-out-of-college chemical engineer handy, but this young man had assured him that tank car unloading had not been a prerequisite for his degree. I thought maybe I could work it out with him over the telephone anyway, so I asked if I could talk to the new alumnus.

"Well, I outlined the entire procedure covering everything from foot valves to vent seals. Then he said, 'Would you run that by again?'

"So I did, several times. And about fifteen dollars later we had the tank car hooked up and unloading. And I now know a proud young chemical engineer who could probably unload a tank car blindfolded—because he had to learn it the hard way."

When it comes to service—we mean business, even if it's not always our own.

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SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; Atlanta; Boston; Buffalo; Chicago; Cincinnati; Cleveland; Detroit; Greensboro, North Carolina; Houston; Kansas City, Missouri; New York City; Philadelphia; St. Louis.
Western Sales Representative: Wilson & Geo. Meyer & Company, San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

MH-30 Dispute Revived Following Special USDA Report

CONTROVERSY over the use of maleic hydrazide in the U. S. tobacco growing industry was revived last month by a special report from the U. S. Department of Agriculture which states that MH-30 changes the chemical and physical properties of the tobacco leaf, presenting a potential hazard to the cigarette leaf industry.

Dr. H. D. Tate, manager of agricultural chemical research and development, Naugatuck Chemical Division of U. S. Rubber Co., producer of MH-30, said however, that the report substantially supports the company's contention that "proper use of MH-30 will result in tobacco equally as good as hand-suckered tobacco." He added that while the report says the chemical "may cause slight chemical and physical changes in a tobacco leaf, the major point emerging from the study is that MH-30 does not lower tobacco quality when it is applied in accordance with the manufacturer's directions."

The study was undertaken by USDA at the direction of the House Committee on Agriculture. It was intended to settle a long-standing dispute between growers and the cigarette industry. The growers, finding MH-30 an effective labor-saver that reduces the cost of suckering tobacco and increases acreage yields, have maintained that it has no harmful effects on the tobacco and causes no reduction in filling capacity. The USDA report, however, states that "the loss in filling capacity alone threatens to reduce substantially the sale of U. S. leaf for economic reasons in such very-high-duty countries as Great Britain and Ireland, which together took 43 per cent of the U. S. flue-cured leaf export in 1960.

"It would also reduce the competitiveness of U. S. leaf in other countries," the report goes on.

Potash Exploration Work

Northwest Co., Ltd., Calgary, Alberta, Canada, will carry out potash exploration work in Saskatchewan's Findlater and Regina Beach-Lumsden areas. The company is a wholly-owned subsidiary of Imperial Oil Ltd. Northwest has been issued exploration permits which cover approximately 199,986 acres.

Nitrogen Div. Advances Coli

Dr. G. John Coli has been named director of development at the Hopewell, Va., plant of Nitrogen Division, Allied Chemical Corp., New York. He had been chief engineer.

Midwestern Buys Badgerland

Midwestern Farm Fertilizers, Stevens Point, Wisconsin, has purchased the assets and trade style of Badgerland Liquid Fertilizers, Almond, Wisconsin.

Midwestern is the manufacturer of Kickapoo and Badger brand fertilizers. The new acquisition will be known as Kickapoo Liquid Fertilizers.

Bright Fertilizer Future

Fertilizer has one of the brightest futures of any segment of agriculture in the coming years, Dr. Floyd W. Smith, Kansas State University agronomist, told the recent convention of the Kansas Grain & Feed Dealers Association at Wichita.

Fertilizer sales in Kansas are expected to reach the 400,000-ton level by June 30, he said. "This represents a 10-fold increase over the fiscal year ending June 30, 1947, and a 100-fold increase compared with 20 years ago." Dr. Smith predicted that Kansas fertilizer sales will reach 500,000 tons per year between 1965 and 1970.

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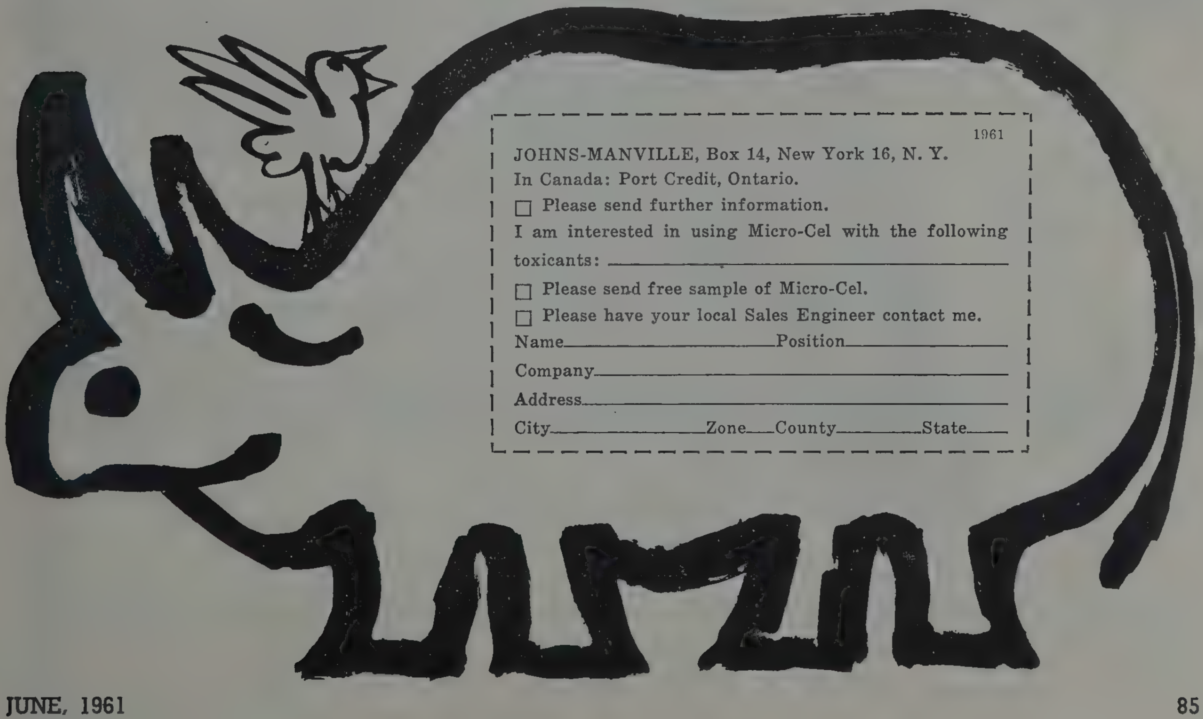

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Our Darvans are true dispersing agents. They disperse finely divided liquids or solids and keep them in suspension.

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State Application ....

Name ....

Title ....

(Please attach coupon to your Company letterhead)

P-19

Moves To Houston Office

Thomas M. Moran, formerly New York district manager in the Eastern Division of Signal Oil and Gas Co., Houston, Texas, has been appointed assistant manager of chemical sales in the Houston office. He has been with Signal Oil for more than six years.

Joseph A. Savoca, formerly a sales representative, has replaced Mr. Moran as New York district manager.

•

Monsanto 29-14-0 Fertilizer

Monsanto Chemical Co.'s Agricultural Chemicals Division is offering a new, high-analysis fertilizer that has been developed specifically to meet the soil needs of crop and pasture land in certain midwestern and southwestern regions. The fertilizer, trademarked Nutrium, is available in bulk and 80-pound bags and is marketed in prilled form. Its analysis is 29-14-0.

The product, made at Monsanto's Luling, La., plant, represents the company's initial move into the making of ammonium nitrate-phosphate materials.

•

PPG Advances Burrell

J. Earl Burrell has been appointed vice president of operations for the chemical division of Pittsburgh Plate Glass Co., Pittsburgh, Pa.

•

Expand Dutch Facilities

The Foxboro Co., Foxboro, Mass., has completed a new instrument manufacturing and assembly building at the Foxboro (Nederland) N. V. plant in Soest, Holland. The new structure gives the plant a total area of nearly 40,000 square feet.

•

Meeting Dates Changed

The joint meetings of the Entomological Societies of Canada and Quebec will be held in Quebec October 16 to 18, instead of October 23 to 25 as had been previously announced.

Heads Chicago District

Burton L. How Jr. has been appointed Chicago district sales manager for the Nitrogen Products Division of W. R. Grace & Co., Memphis, Tenn. Mr. How, who joined W. R. Grace in 1953, had been anhydrous ammonia product manager in Memphis. Prior to this, he had been in the New York office for two years.

As Chicago district manager, Mr. How is responsible for a territory that includes North Dakota, South Dakota, Nebraska, Iowa, Minnesota, Wisconsin, Michigan, Ohio, and the northern half of Illinois and Indiana.

•

Pacific Branch Meets June 20

The Pacific Branch, Entomological Society of America, will meet at the Miramar Hotel in Santa Barbara, Calif., June 20 to 22. Among the topics to be discussed at the meeting are mite resistance, biological control of weeds, relation of spray deposits to plant surfaces and insect control, and the physical aspects of insecticides and their relation to application techniques.

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- **BAY-SOL®** nitrogen solutions
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Atlanta, Georgia

Escambia To Handle Sales

Escambia Chemical Corp., Pensacola, Fla., will assume the responsibility for the sales of its nitrogen products, effective July 1. Ashcraft-Wilkinson, who had been exclusive sales agents for Escambia in both the fertilizer and industrial markets since 1955, will continue to represent Escambia until July 1.

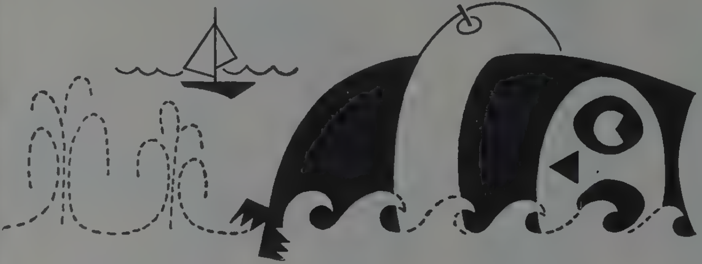
Escambia's nitrogen sales and technical service organization will be headquartered in Atlanta, with sales representatives to be located throughout the southeast marketing area served by its Pace, Fla., plant.

•

Goldsmith Joins U. S. Borax

David W. Goldsmith has joined United States Borax & Chemical Corp., Boron, Calif., as senior process engineer. Mr. Goldsmith formerly was associated with American Potash & Chemical Corp.

Barden Clay Quiz



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Everyone knows Barden's outstanding superiority in suspension: it's a "must" in preparing wettable powders. Barden is the industry's kaolin standard for a carrier-diluent in wettables and dusts; for an anti-caking conditioner in prilled fertilizers, and 93-94 percent sulfur.

These Barden features make it superior for all formulations: lowest abrasion... better sticking... high bulking value... greater uniformity... better deposits ... maximum economy... superior wettables.

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The Low-Cost Scientific Diluent
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Interested in 75% Wettables and Concentrates? Zeolex 7A is the new synthesized carrier for top results. It's versatile, too: serves as a bulking agent, and as a static-free conditioner for 99 percent sulfur grinding. Write for more information.

Urges More Basic Research

American universities are being turned into "mere discovery factories" by the $900 million a year the government spends for scientific research on the campus, Dr. Max Tishler told a dinner of the Industrial Research Institute at Boca Raton, Fla. Dr. Tishler, who is president of the Merck Sharp & Dohme Research Laboratories Division of Merck & Co., Inc., made his remarks in accepting the institute's 1961 Medal for leadership in industrial research.

He warned that unless university researchers devote more time to teaching future scientists, the "wells of discovery eventually will dry up." He recommended that government research and development programs directed at specific problems be separated from the campus. Instead, the universities should "be provided with funds for free, creative, and self-stimulated pursuit of new knowledge," he said.

•

Supervises SE Sales

Norman R. Downey has been named to supervise sales of Hercules Powder Co.'s agricultural chemicals in Florida, Georgia, Alabama, and a major portion of Tennessee. Mr. Downey has been with Hercules since 1942 and, in his most recent assignment, served as senior technical representative for agricultural chemicals.

•

Fairfield Specialty Line

Fairfield Chemicals, Food Machinery and Chemical Corp., New York, is offering a new Powco brand line of specialty base products that includes several specially conditioned forms of Dri-Die, W. R. Grace and Co.'s insecticidal silica aerogel, combined with Pyrenone. The Powco line also includes products formulated with Sevin.

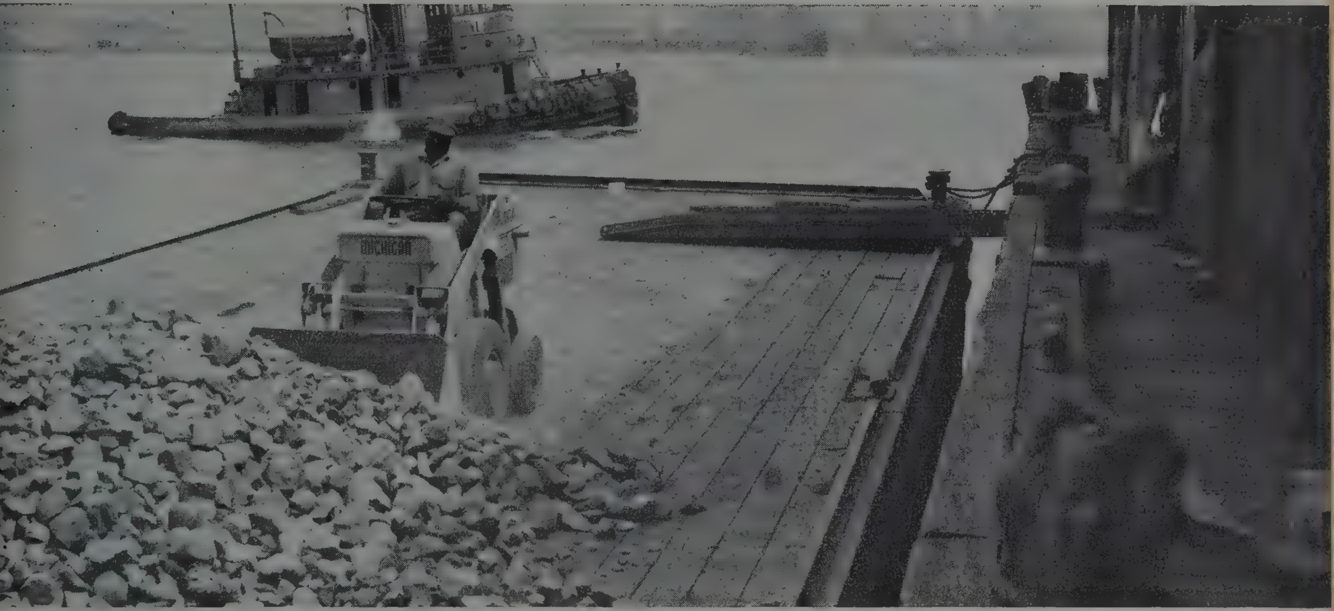
•

Springer Joins Central

Frank B. Springer Jr. has joined Central Chemical Corp., Hagerstown, Md., as a technical service representative.

TOUGH MATERIAL SPECIALIST—

The Model 12B Michigan



CHROME and CARBORUNDUM ORE are unloaded fast by this 16 cu ft Model 12B. Owner. New York Central RR. Location: Jersey City.

Like all Michigans, the 12B has efficient all-Clark power train, including power-shift transmission, torque converter, planetary-wheel drive axle.

BROKEN GLASS reclaiming is the prime use of this Michigan Model 12B owned by Fairmount Glass Works, Indianapolis, Indiana.

BROKEN TILE, 400 tons per 8 hour day—that's the output of the two 12B's owned by Oconee Clay Products Co., Milledgeville, Georgia.

DOLOMITE, charged directly into red-hot open hearths, is this Michigan's tough, but successful assignment in this Illinois steel plant.

COKE, used by American Brake Shoe Co, Buffalo, is dumped into hopper. Note cramped quarters easily negotiated by the Model 12B.

FERTILIZER, tight-packed and hard to dig, yields to powerful Virginia-owned Model 12B. Note the heaped bucket, a "trademark" of all Michigans.

Your "tough jobs," too, are made to order for Michigan Tractor Shovels. Model 12B capacity is 3,000 lbs, buckets are available to carry from 6 to 27 cubic feet. Write for details.

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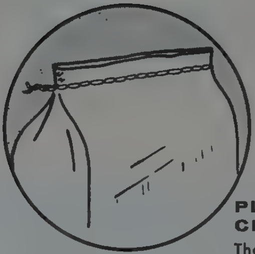

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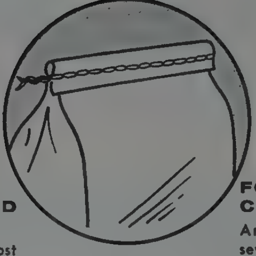
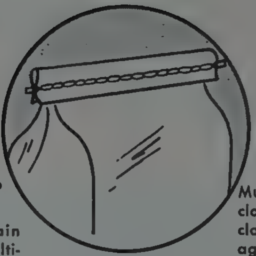
The simplest and most popular sewed closure for textile, paper-lined textile and paper bags of all sizes.



FOLDED TOP CLOSURE

An excellent plain sewed closure for multiwall paper bags. Bag top is folded over and sewed through to form a strong, neat closure.



TAPE-BOUND CLOSURE

Multiwall paper bags closed with tape-bound closures add to package sales appeal and provide a bag that can be handled without fear of closure breaks.

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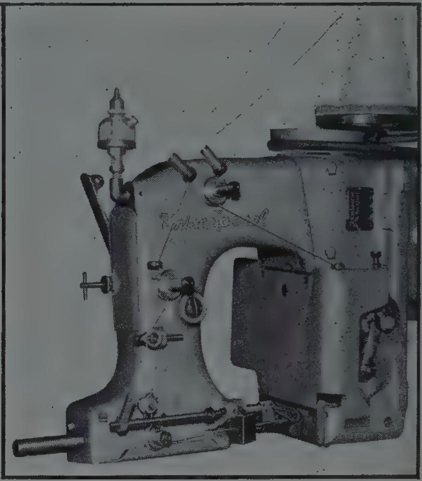
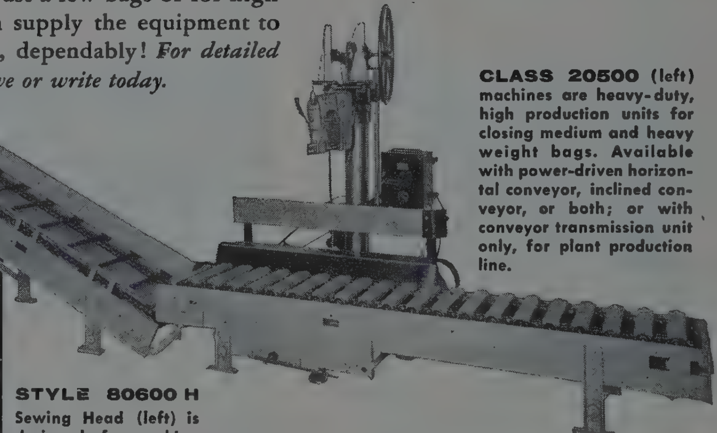
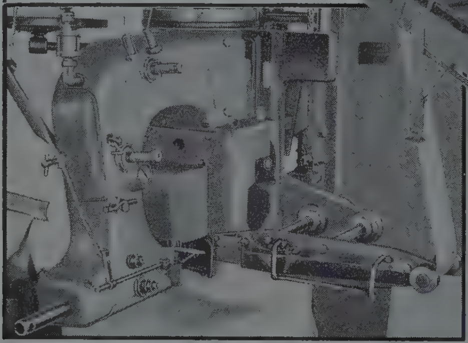
If you're interested in bringing packing costs down, here is the way to do it. Take advantage of Union Special's wide knowledge of bag closing and its problems. By selecting your equipment from Union Special's complete line you can get the correct equipment for your particular job — equipment that will do it better, faster and cheaper, giving you a stronger closure at lower cost.

In the Union Special line you will find machines for closing all sizes and kinds of bags from small textile or paper bags up to the largest multiwall paper bags in use today. Whether your production schedule calls for closing just a few bags or for high continuous output, Union Special can supply the equipment to do the work efficiently, economically, dependably! *For detailed information, see our nearest representative or write today.*





CLASS 20500 (left) machines are heavy-duty, high production units for closing medium and heavy weight bags. Available with power-driven horizontal conveyor, inclined conveyor, or both; or with conveyor transmission unit only, for plant production line.



STYLE 80600 H Sewing Head (left) is designed for making tape bound closure on multiwall paper bags. Automatic tape clipper.

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Lundahl Advanced By Grace

Lloyd E. Lundahl, Jr. has been appointed general manager of Caribe Nitrogen Corp., San Juan, Puerto Rico. He had been plant manager since 1959. Caribe Nitrogen is operated by the Nitrogen Products Division of W. R. Grace & Co.

Mr. Lundahl joined the Nitrogen Products Division in 1954 as assistant chief engineer at its Memphis, Tenn., plant.

•

Chipman Names Brooks

Chipman Chemical Co., Bound Brook, N. J., has appointed Warren W. Brooks as sales representative and technical advisor for its St. Paul, Minn., district. Mr. Brooks formerly was supervisor of wood preservation for the National Pole Treating Division of Minnesota and Ontario Paper Co.

•

Vulcan Names Lynch

David W. Lynch has been named vice president-sales for Vulcan-Associated Container Companies, Inc., Birmingham, Ala. He had been general sales manager.

•

Esso To Build In Wales

Esso Petroleum Co., Ltd., and Fisons, Ltd. will build an ammonia plant adjacent to Esso's new refinery at Milford Haven, Wales. The plant will be operated by Esso on behalf of a joint company to be formed on a 50-50 basis by Fisons and Esso.

The plant's output will be piped to a wholly-owned Fisons plant which will be built nearby. Fisons will use the ammonia to make nitrogen products for the fertilizer and chemical industries.

•

U. S. Borax To Market FTE

The Ferro Corp., Cleveland, Ohio, has appointed U. S. Borax & Chemical Corp. as its national sales representative for the marketing of its fritted trace fertilizer supplement, FTE, in the domestic fertilizer industry.

Huber Buys International Clay

J. M. Huber Corp., New York, has acquired the assets of International Clay Co., Graniteville, S. C. International Clay's kaolin mine and properties adjoin Huber's largest mine in South Carolina.

•

Entomologists To Meet

The 32nd annual meeting of the Rocky Mountain Conference of Entomologists will be held at the Cameron Pass 4-H Club Camp (near Gould, Colorado), August 6 to 10.

•

Niagara Adds Four

Four midwestern sales representatives have been added to the staff of Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, N. Y. They are: Kenneth M. Harrison, southwestern Indiana and western Kentucky; Robert T. Morgan, northern Indiana; Robert D. Shockey, southeastern Indiana and central Kentucky; and E. Dean Wolfe, Nebraska.

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THE SUPERIOR ANTI-CAKING, CONDITIONING AND COATING AGENT FOR HIGH-ANALYSIS, GRANULAR, COMPLEX FERTILIZERS

KENITE 51 made from high-quality diatomite (diatomaceous silica) is highly economical to use. It is up to 400 percent more efficient than other conditioners because of its greater surface area. This means less is needed, leading to a very low cost per ton of fertilizer conditioned.

Write today for complete information on KENITE 51 and learn how it will improve the handling of your fertilizer and result in more satisfied customers.

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now...use Thiodan® on all these

Broader registration for Thiodan—powerful new insecticide—gives you effective, economical control of aphids and many other important insects.

Thiodan cleans up heavy aphid infestations where other sprays and dusts fail. It outperforms previously available materials; fewer applications give positive, long-lasting control of a wide range of vegetable insect pests.

CROP	TO CONTROL	APPLICATION
Beans	Mexican bean beetle	Up to pod formation
Broccoli Cabbage Cauliflower	Cabbage looper, imported cabbage worm, diamond-back moth larvae, cross-striped cabbage worm	Up to formation of edible parts
Cucumbers, Melons, Squash	Aphids	Up to 14 days prior to harvest
Eggplants, Peppers	Aphids	Up to 7 days prior to harvest
Potatoes	Flea beetle, Colorado potato beetle, leafhoppers, aphids, southern armyworm, green stink bug, potato tuberworm, leaf-footed plant bug	Up to harvest
Tomatoes	Aphids, whitefly, Colorado potato beetle, flea beetle, green stink bug	Up to 7 days prior to harvest

Thiodan is a registered trade-mark of Farbwerke-Hoechst A.G.

Thiodan®

TECHNICAL CHEMICALS DEPT., NIAGARA CHEMICAL DIVISION, FOOD MACHINERY AND CHEMICAL CORPORATION, MIDDLEPORT, N.Y.

General Chemical Poster Campaign Aimed At Farmers

The General Chemical Division of Allied Chemical Corporation is introducing a number of products to farmers in 14 states from coast to coast through poster advertising. The principal products being advertised in this manner are Plyac, a spreader-sticker, and three miticides, Tedion, Ethion, and Genite. The posters are located so as to cover farmers' travel patterns and to coincide with growing seasons. Magazines and newspapers also are used in the campaign.

2,4-D Provokes Farm Hassle

A disagreement over the use of 2,4-D between two farm groups in Oregon—the wheat ranchers and the small fruit and vegetable growers—. has been temporarily settled by the state's House Agriculture and Livestock Committee at a hearing on a proposed bill that would regulate the use of 2,4-D on agricultural lands.

The truce was made possible when the committee said it would suggest an amendment to an Oregon statute that established a 10-mile restricted zone between wheat fields and horticultural land in the Milton-Freewater area of Oregon. In this buffer zone only a low-volatile herbicide can be used. The committee also tabled the proposed legislation.

The proposed amendment would add another 10 miles to the restricted area. At the same time, the committee said that it would ask for a $10,000 appropriation to investigate the effects, if any, of high-volatile herbicides on small crops.

The Blue Mountain Horticultural Society in Milton-Freewater had charged that the small fruit and vegetable industry in northeast Oregon, valued at more than $3 million, was being threatened by the high-volatile herbicide which damaged small crops. The wheat ranchers contend the high volatile chemical is the only one that can successfully kill the weeds that hamper wheat growth. And, wheat ranchers added, there was no scientific proof that the 2,4-D damaged the small crops.

•

IMC Management Seminar

Some 65 plant food executives are scheduled to attend a Fertilizer Management Seminar to be sponsored by International Minerals & Chemical Corp., at IMC headquarters in Skokie, Ill., July 19 to 21. The sessions will be concerned with a hypothetical case history that covers ten broad topics of executive concern — administrative management, financial management, insurance, purchasing, transportation, personnel development, public relations, marketing, production, and future growth possibilities.

In addition to the formal program, John Baker, director of the Agriculture Credit Service, U. S. Department of Agriculture, will discuss "The Administration's Agricultural Policy and Program" at a banquet session on July 20.

•

To Mine Coal For Fertilizer

American Humates Inc., Dallas, Texas, has been awarded leases on more than 4,000 acres of federal coal-bearing land north of Glenrock, Wyoming, where it will construct a 75-tons per day fertilizer plant this fall. The coal is said to have unusually high content of nitrogen and oxygen and will be sold only to fertilizer companies.

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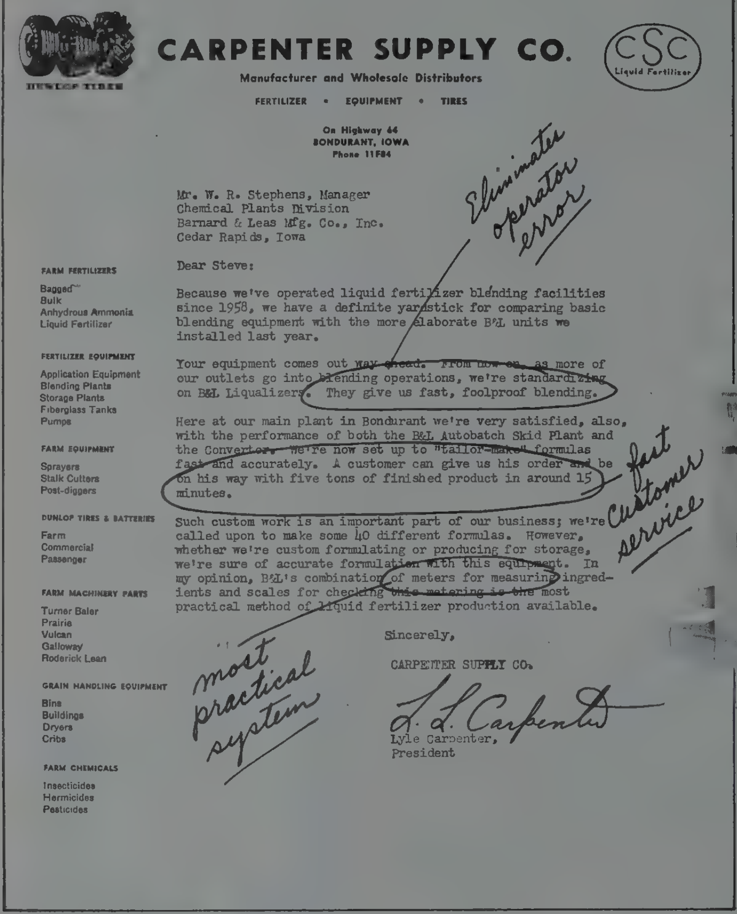
Carpenter Supply Co., Bondurant, Iowa, has built a highly successful business through providing a well-rounded service to farmers. In 1960, a complete B&L plant for manufacturing liquid fertilizers was installed, and in addition several CSC dealers have so far been equipped with B&L Liquafizers for local blending operations.



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- Prairie
- Vulcan
- Galloway
- Roderick Lean

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- Buildings
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Mr. W. R. Stephens, Manager
Chemical Plants Division
Barnard & Leas Mfg. Co., Inc.
Cedar Rapids, Iowa

Dear Steve:

Because we've operated liquid fertilizer blending facilities since 1958, we have a definite yardstick for comparing basic blending equipment with the more elaborate B&L units we installed last year.

Your equipment comes out way ahead. From now on, as more of our outlets go into blending operations, we're standardizing on B&L Liqualizers. They give us fast, foolproof blending.

Here at our main plant in Bondurant we're very satisfied, also, with the performance of both the B&L Autobatch Skid Plant and the Convertor. We're now set up to "tailor-make" formulas fast and accurately. A customer can give us his order and be on his way with five tons of finished product in around 15 minutes.

Such custom work is an important part of our business; we're called upon to make some 40 different formulas. However, whether we're custom formulating or producing for storage, we're sure of accurate formulation with this equipment. In my opinion, B&L's combination of meters for measuring ingredients and scales for checking this metering is the most practical method of liquid fertilizer production available.

Sincerely,

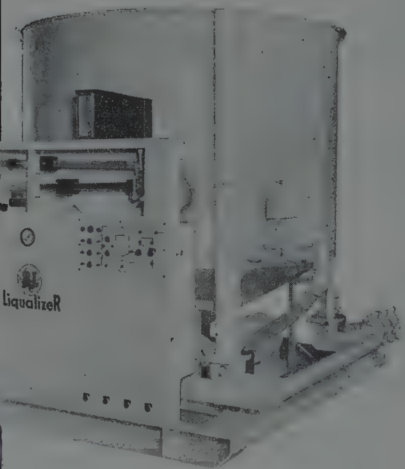
CARPENTER SUPPLY CO.

L. L. Carpenter
Lyle Carpenter,
President

Eliminates operator error

fast customer service

most practical system



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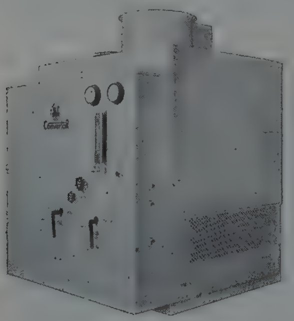

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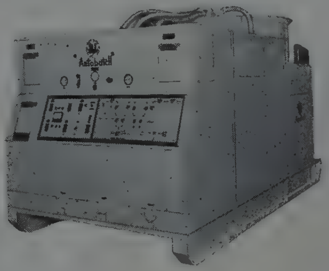

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ICC Balks Freight Fare Cut

The Interstate Commerce Commission has disapproved a bid by the Atlantic Coast Line Railroad and the Seaboard Air Line Railroad to lower the freight charges for phosphate rock from Florida to Norfolk, Va. The railroads had proposed a rate of $4.75, down from $5.36, per ton on bulk phosphate rock. Specifically, the proposal covered bulk material in covered hopper cars—carload minimum 140,000 pounds, minimum 500 tons a shipment—moved on the same day on one bill of lading to one consignee at one destination between the Florida pebble rock district and the Norfolk area.

The ICC felt the move was an effort on the part of the railroads to strengthen their hold on the phosphate rock business by accepting a reduction in net revenues. "Considering," the ICC said, "the critical need for increased revenues by these and other carriers, the proposed rate may not be approved as lawful."

•

Label Claims Listed

Di-Syston granular insecticide has been registered for use on potatoes to control aphids, leafhoppers, and flea beetles. Also, Dylox 50 per cent soluble powder and Dylox dust now are registered in the U. S. for use on tobacco.

In other moves, the U. S. Department of Agriculture last month cleared the use of Sevin 50 per cent wettable powder insecticide in sprays on filberts. Sevin was used last year in dust formulations but some tests have indicated that spray applications may give more effective control. The label registration for the use of Diazinon on tomatoes for the control of Drosophila (vinegar flies), dipterous leafminers, and aphids has been altered to reduce the interval between application and harvest from three days to one day.

The registration for Thiodan insecticide has been broadened to include two additional potato pests—potato psyllid and European corn borer—and to permit the use of Thiodan on pears for the control of consperse stink bug through the petal fall stage.

•

Increased Production Begins

Production has begun at a new plant for Urox and Urab herbicides at the Baltimore, Md., works of Allied Chemical Corp.'s General Chemical Division. The new facilities permit a 400 per cent increase in production capacity.

•

Robert Fiss Joins CSC

Robert L. Fiss, formerly of United States Steel Export Co., has joined Central Resources Corp., New York, where he will be active in the latter's international fertilizer activities.

•

Kimball Elected By Snell

Cyrus S. Kimball has been elected president of Foster D. Snell, Inc., New York. He had been executive vice president of the corporation since 1953.

Mr. Kimball succeeds Dr. Foster D. Snell, who has served as president and chairman of the board of the corporation since its founding in 1930. Dr. Snell continues as chairman of the board.

•

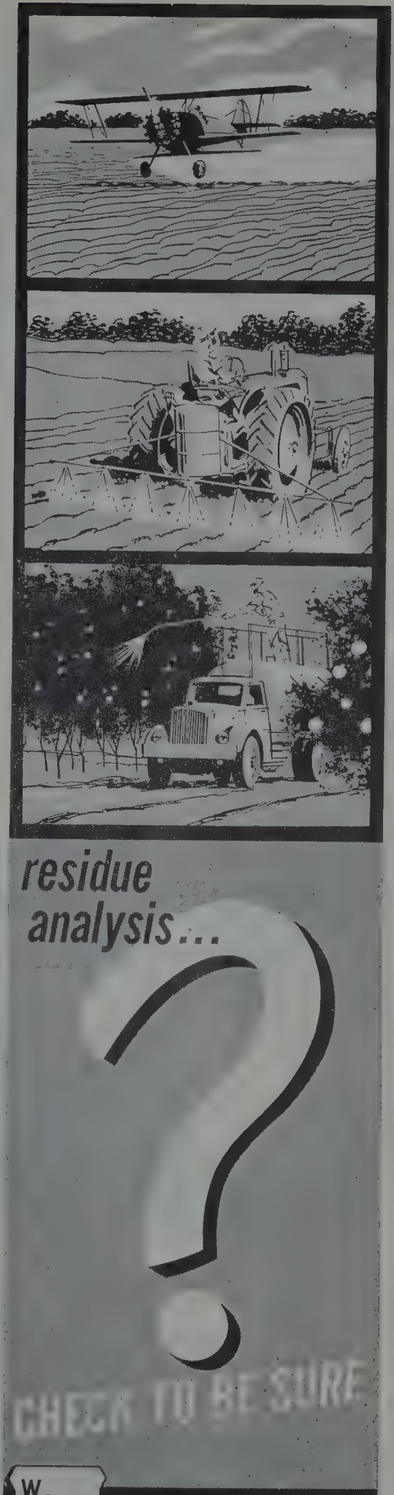
Ortho Merges Districts

California Chemical Co., Ortho Division, has consolidated its mid-Atlantic and western New York districts. Dr. Robert T. Wallace, formerly manager of the mid-Atlantic district, is manager for the new district. M. E. Wierenga, Ortho's marketing manager and vice president, said that the new district was formed because of the increased interest being placed on outdoor living and gardening. The 15-state area now is serviced from headquarters at Haddonfield, N. J.

•

Chipman Appoints Huckins

Chipman Chemical Co., Bound Brook, N. J., has appointed Robert K. Huckins as technical service representative for its Chicago district. He has been with Chipman since 1957.



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Book Reviews

Pesticide Specifications

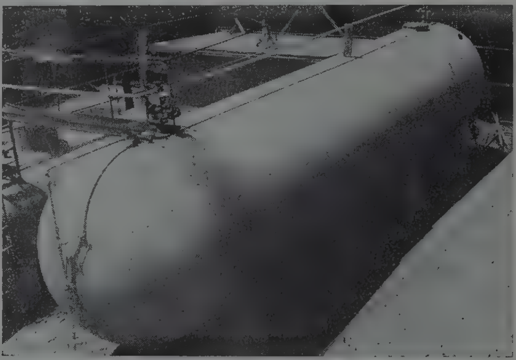
Specifications for Pesticides, published by the World Health Organization, Geneva, Switzerland. Price $10, 523 pages.

This manual contains the specifications established by various World Health Organization Expert Committees on Insecticides between 1950 and 1958 for the most important pesticides used in the control of human diseases and for the equipment necessary to apply these products. It will serve as a guide to both manufacturers and users of such products and equipment.

The book is divided into six main parts, dealing respectively with insecticides, rodenticides, molluscicides, herbicides, auxiliary chemicals (anti-louse products, synergists, anti-oxidants, etc.), and spraying and dusting apparatus. This is the second edition of this work and it has been considerably enlarged by the inclusion of specifications for a range of new substances and formulations. In addition, a number of specifications have been revised, mainly as regards methods of analysis. The first edition was published in 1956.

The new specifications relate to the insecticides chlorthion and dipterex and their formulations, diazinon and malathion dusting-powders, larvicidal oils and granules, and new rodenticides and auxiliary chemicals. A section on herbicides is entirely new. On the other hand, no changes or additions have been made in the specifications for spraying and dusting equipment.

This worthwhile reference work is available in the United States from the Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N. Y.



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Report To Foresters

The Use of Chemicals in Southern Forests, edited by Robert W. McDermid. Published by Louisiana State University Press, Baton Rouge. 152 pages, price $4.

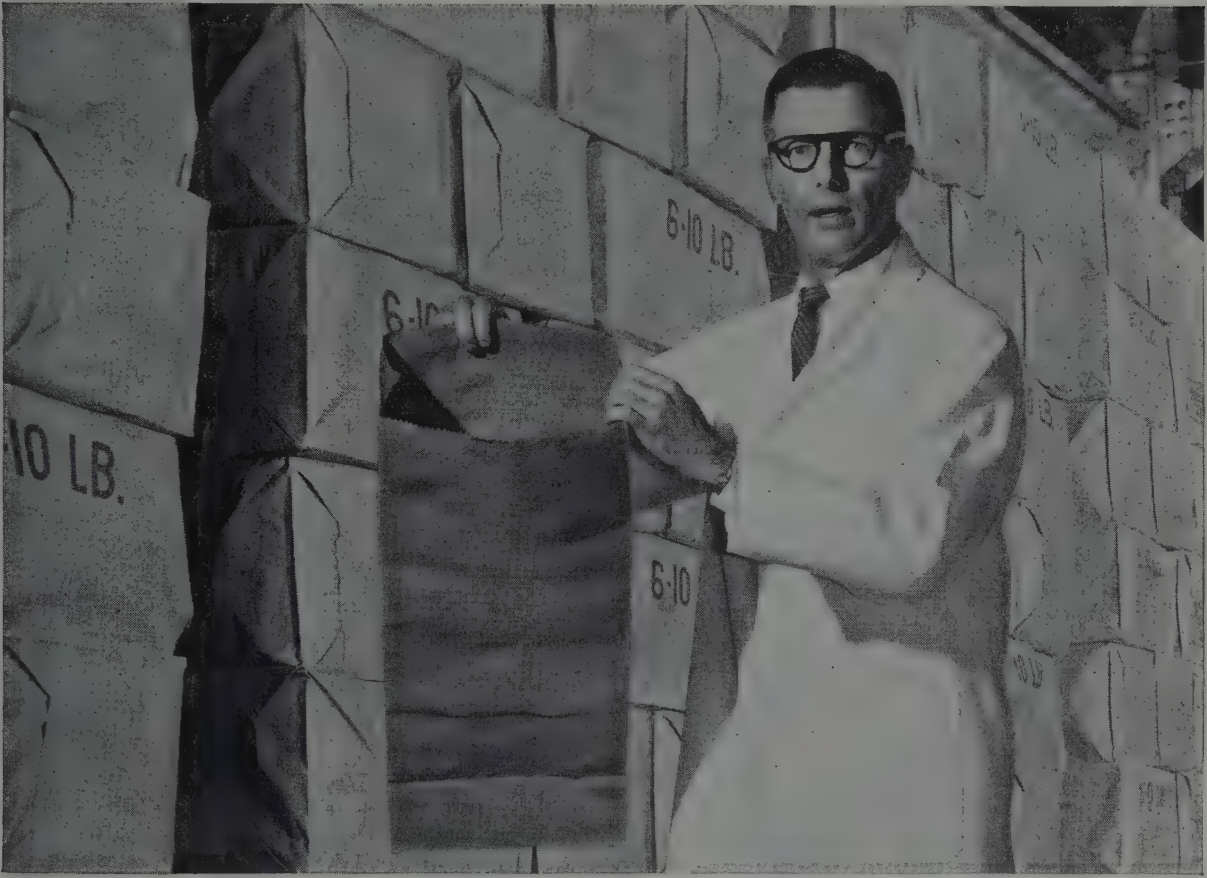
A compilation of 15 papers presented at the ninth annual Forestry Symposium at Louisiana State University last year, this volume constitutes a report to the practicing forester on the progress which has been made to date by forest scientists in adopting and utilizing chemicals as forest management tools.

Among the authors and their topics included in the book are: Albert L. Leaf, Syracuse University, "Forest Fertilization Research and Application in Other Countries"; J. Fielding Reed, American Potash Institute, "Forest Fertilization Research and Application in other Regions of the United States"; Laurence C. Walker, University of Georgia, "Observations on Forest Fertilization"; Fred A. Peevy, USDA, "Basal Application of Herbicides for Control of Woody Plants"; and John H. Kirch, Amchem Products, Inc., "Foliar Application of Chemicals to Weed Tree Species."

Also: Paul Y. Burns, Louisiana State University, "Use of Aircraft for Foliar Applications of Herbicides in Southern Forests"; Ernest A. Epps, Louisiana Department of Agriculture, "Legal Problems Connected with Widespread Application of Chemicals"; James A. Beal, USDA, "Combating Forest Insects with Chemicals"; and John L. George, U. S. Fish and Wildlife Service, "Possible Effects of Widespread Use of Forest Chemicals on Wildlife Populations."

Not only are the complete texts of these and other talks reproduced in this book, but notes of discussions held following each address also are included, as are illustrations and charts. A complete listing of literature cited by each speaker also is included to make this a most valuable reference work for practicing foresters.

Another Technical Advance from West Virginia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LITERATURE AVAILABLE

Bulletins listed in this column are available from the organizations by which they are prepared.

Public Relations . . . *Chemicals and Foods,* by U. S. Dept. of Agriculture, Picture story No. 127, August, 1960. 8 pages. Pictures illustrating what pests can do to crops and livestock and what is being done to protect same. USDA, Office of Information, Wash., D. C.

AC

Ammonium Nitrate . . . *Ammonium Nitrate-Behavior in Fires,* by Chester I. Babcock, NFPA Q 53-10, Reprint from January, 1960. 8 pages. List conditions necessary for accidental fires, and suggests correct storage method of ammonium nitrate in buildings. National Fire Protection Assn., 60 Batterymarch, Boston 10, Mass.

AC

Public Relations . . . *Chemicals in our Food,* reprint from *Changing Times,* May, 1960. 6 pages. Explains what is added to foods and why. 1729 H St., N.W., Wash., D. C.

AC

Khapra Beetle . . . *A Summary of Information About the Khapra Beetle,* U. S. Dept. of Agriculture — Market Quality Research Division, AMS-390, July, 1960. 12 pages. Discussion on biology, feeding habits, life history, and control of this beetle are presented with references and related topics listed. USDA, ARS, Wash., D. C.

AC

North Carolina Report . . . *North Carolina Insecticide Report for 1958,* North Carolina Dept. of Agriculture, Number 156, June, 1959. 128 pages. Economic poisons used in North Carolina. N. C. Dept. of Agriculture, Raleigh, N. C.

AC

Public Policy . . . *Pesticides and Public Policy,* by Nat'l Ag. Chem. Assn., May, 1960. 21 pages. Describes pesticide industry and various incidents, plus congressional and senatorial investigations of the industry. NACA, 1145 19th St., Wash., D. C.

AC

Maine Research . . . *Maine Farm Research,* Frank J. McDonald, Volume 8 No.2, July 1960. 38 pages. The history of Maine's agriculture, viewed from the Highmoor farm. Maine Agric. Exp. Station, Orono, Maine.

AC

Aerial Spraying . . . *How to Spray the Aircraft Way,* by U. S. Dept. of Agriculture. Farmers Bulletin No. 2062. Issued June, 1954. 32 pages. How spraying can save you money and give you various benefits by using careful planning and teamwork. Also gives spraying facts and figures plus the laws pertaining to spraying. USDA, Wash., D. C.

AC

Pesticide Handbook

Pesticide Handbook by Donald E. H. Frear. Published by College Science Publishers, State College, Pa., Price $2 paper bound; $3 cloth bound. 286 pages.

This is the thirteenth annual edition of Pesticide Handbook and it contains information about 9,072 commercial pesticide products, an increase of about 15 per cent over the 1960 edition. Furthermore, compatibilities, hazards, and tolerances are listed for the more common pesticides and a complete listing of manufacturers and their products also is included.

Among the products listed are insecticides, fungicides, herbicides, rodenticides, soil conditioners, and equipment, making this a valuable reference guide for those interested in any phase of insect control.

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NEWS BRIEFS

M. E. Ocker, manager of the Wichita plant and sales division of Bemis Bro. Bag Co., St. Louis, since 1928, retired recently. He had been with Bemis for more than 50 years.

AC

William Hightower has been appointed to the south central district field sales staff of Geigy Agricultural Chemicals, division of Geigy Chemical Corp., Ardsley, N. Y. He had been with Velsicol Chemical Corp., Chicago.

AC

A Safety Citation and plaque have been awarded to the Middleport, N. Y., headquarters of the Niagara Chemical Division, Food Machinery and Chemical Corp., for 1,491,887 man hours without a lost time accident.

AC

Charles W. Bourg has been named industry representative—agriculture, for the marketing development division of United States Steel Corp., Pittsburgh, Pa. He has been with the company since 1956.

AC

Chester E. Graves, manager of the Palo Alto, Calif., biochemicals sales district of the Du Pont Co.'s industrial and biochemicals department, will retire July 1 after 32 years with the company.

AC

Dr. Herbert E. Morris, director of the Boston Laboratories of Monsanto Research Corp. at Everett, Mass., has been appointed technical director of the corporation.

AC

George C. Rayner has been appointed assistant to the president of Allied Chemical's General Chemical Division. He has been with the division for 30 years.

AC

James P. Gurney, executive secretary-editor of the American Rose Society, plans to resign from the society and will be associated with O. M. Scott & Sons Co., Marysville, Ohio.

AC

Louis E. Childers, an information chief in the Department of Agriculture, died last month in Washington, D. C. He was 60 years old. Since 1954, Mr. Childers had directed the current information branch of the Agricultural Research Service.

AC

Russell I. Pisle has been named staff assistant to the agricultural sales manager by the Sohio Chemical Co., Lima, Ohio. He joined Sohio in 1955.

AC

Bemis Bro. Bag Co., St. Louis, spent more than $2,750,000 on its plant expansion and modernization program during 1960, according to the company's annual report.

Barry A. Frazee has been appointed sales representative for United States Borax & Chemical Corp. in Texas, Oklahoma, and New Mexico.

AC

Arthur H. Swanson has been appointed director of purchasing for Stauffer Chemical Co., New York. He succeeds Kenneth H. Allen who died last month.

AC

William S. Cummings has joined Gray Chemical Inc., Gloucester, Mass., as marketing manager for fertilizer products. He had been with Vick Chemical.

AC

Benjamin R. Pickering has been elected assistant secretary of United States Borax & Chemical Corp., Los Angeles. He has been with U. S. Borax and its predecessor company, U. S. Potash, since 1951.

AC

Herbert Spencer Cohen, vice president of American Metal Climax, Inc., New York, died last month in Brooklyn, N. Y. He was 59 years old.

AC

The Virginia Smelting Co., West Norfolk, Va., has changed its name to Virginia Chemicals & Smelting Co.

AC

Robert J. Smith, Jr. has been appointed a technical sales representative by Chemagro Corp., Kansas City, Mo.

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CSMA MEETING

(From Page 38)

containing the insoluble poisons, such as diazinon, and baits containing 0.1% DDVP were more attractive than baits containing higher concentrations of the same chemical.

Dr. Decker concluded that a number of factors, such as weather, number of animals, and regularity of morning treatments, would affect the efficiency of the bait treatments.

Insecticide Marketing

"There is more consumer ignorance about insecticides than almost anything else one can find in the modern supermarket. There also is more confusion at the insecticide display . . . confusion between products of the same manufacturer . . . confusion between competing brands." This statement was a highlight of a paper titled "A Consumer Looks at Insecticide Marketing" by Andrew B. Meldrum, Meldrum and Fewsmith, Inc., Cleveland, O.

"Because of self-service, and because of the confusion in consumers' minds, it is my feeling that the biggest — and one of the easiest — areas where insecticide manufacturers can help themselves is in the way they package their products. I'm not talking about the overall design or color or attractiveness. In most cases, insecticide packages look just as modern as any. But insecticide manufacturers have a different problem — that of answering consumer ignorance. Before a customer buys any product, he wants to know the answers to three questions:

(1) What is it for?
(2) How do I use it?
(3) What results can I expect?"

A translation of these questions to the insecticide package, Mr. Meldrum suggested, reveals few answers. He reported a conversation with a salesgirl in which she displayed little knowledge of any of these questions. This proves, he suggested, that "manufacturers can no longer assume that salespeople will do a careful or intelligent job of explaining their products."

"More and more, the package will determine what happens at that vital point of sale. Answer the consumers' questions, and increased sales will be the reward. Why not tell how the product works? Does it kill only on contact, or while the spray is still wet? Does it do anything to get at the source, like the poison the ants eat and take back to their nest? And what is the difference between the house and garden killer and the ant and roach killer? There isn't one consumer in a hundred who — looking at two typical packages — could tell the difference. I know, of course, that the formulations are on the back . . . but a consumer is not a chemist."

The remainder of Mr. Meldrum's paper was devoted to photographic slides showing typical displays in self-service food and drug stores. By use of these he demonstrated the same-ness of the various competing brands in answering the key questions. He complimented Boyle-Midway's "Black Flag Ant & Roach Killer" for telling the consumer how long the material will last. He charged that even major marketers of insecticides are "Turning over the job of writing the small print on the backs of insecticide packages to guys in an advertising department. The result is a rewrite of what your competitors are saying. You certainly are not getting any original ideas, related to what consumers want to know."

Pest Control In Russia

Dr. H. L. Haller, assistant to administrator, Agricultural Research Service, USDA, Washington, D. C., presented some personal observations on pest control in Russia and other European countries. He described a tour he made of Russia during the summer of 1959 as a member of a U. S. delegation sent to the Soviet Union to observe insect control procedures.

Control of agricultural insect pests in the Soviet Union, he reported, is achieved with insecticides, biological methods, and cultural practices. The insecticidal chemicals available for practical use are limited in number, he said, compared to those available in the U. S. The principal insecticides are chlorinated hydrocarbons and organic phosphates. Of the chlorinated hydrocarbons, DDT and BHC (geksachloran) are the most widely used. DDT, Dr. Haller said, is used as a dust and a wettable powder.

There was no evidence, he said, that organic fungicides, now widely used in the United States, are available in the USSR. Some of the chlorinated hydrocarbons that are used commercially in the U. S., such as aldrin, chlordane, dieldrin, endrin, heptachlor, and toxaphene, have been studied experimentally in the USSR, he said. Dr. Haller added that there is considerable interest in organic phosphates as insecticides, particularly as systemic insecticides.

Statistics on insecticide use in the USSR were not obtainable, Dr. Haller said. In the course of gen-

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AIRFLOATED
BAGGED OR BULK
GUARANTEED LESS 1% FREE MOISTURE
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eral discussions, however, he reported, the statement was made that in the Ukraine 70,000 tons of insecticides and 11,000 tons of fungicides are used annually. In Uzbek Republic, it was stated that 208 tons of organic phosphates were used in 1958 and it is estimated that in 1959, 800 tons of organic phosphates were applied to crops.★★

LEGAL PROBLEMS

(From Page 55)

users of chemicals. If work is needed, the safer the job done, the less likely are restrictions to be imposed. Regardless of what may be thought, legislators and state officials do not just rush right out and hatch up regulations or pass legislation merely for the sake of doing so. They do so only when a problem has arisen. If applicators and other users of agricultural chemicals can conduct their affairs in such a way that no problem arises, they can be assured that there will be no legislation and no regulations.

Chemicals can be dangerous and can cause trouble in a number of different ways, but they can be handled safely. They are being safely handled by many people every day, year in and year out. Applicators must be forewarned and forearmed. They must inform themselves of the hazards, use common sense, and not take chances.★★

STANDARDIZATION

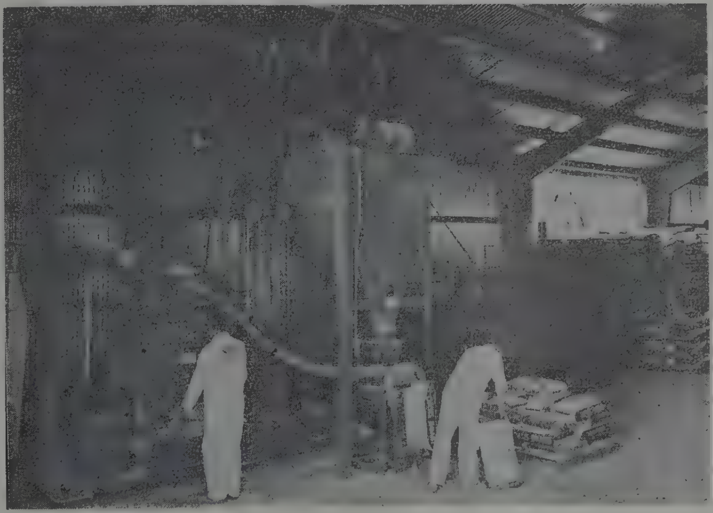
(From Page 16)

But once that supplier is found, future conformity is assured.

"Potash falls in about the same category as solid nitrogen. Each supplier has his own automatic size distribution, and a manufacturer who buys from one supplier has only minor difficulty in predicting what he will receive as a given grade of potash.

"Phosphate is the big headache. Analyses are unpredictable and particle size ranges in the run of pile and coarse grades are also unpredictable. I can understand why analyses vary. When the analytical method for determining a quantity depends on sample size, time of extraction, degree of agitation, presence of soluble salts, temperature and pH of extractant, it can be seen that correlation between laboratories might be poor.

"In addition, when the quantity desired is affected not only by the particle size of the raw materials, length of cure of the product, and source of raw materials per se, but also by the normal variation in the ratio of raw materials used, it is understandable that variations would occur in product analyses. However, the above reasons for variations should not be a reason for negligence on the part of the supplier to send a copy of the analyses to the user by whatever means are necessary to ensure that



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the user receives the analyses before he receives the product shipment.

"With the inherent variability of the P_2O_5 content of triple superphosphate, it is preposterous to assume that a given carload unloaded from a barge will have an analysis within 0.5 units P_2O_5 of the barge average. The logical answer is to provide means for determining APA quickly as cars are loaded, regardless of where they are loaded, so the user can receive analyses before the shipment arrives.

"Because of the inherent variability of APA in an acidulated rock phosphate product, setting up 0.5 limits of variance for triple superphosphate appears impractical to me. When our own superintendents can guarantee their manufactured normal superphosphate within ± 0.2 units APA, where they have control of the manufacturing process, I will believe that they can expect triple superphosphate within ± 0.5 units APA.

"To repeat, the exact APA of a phosphate product is not as important as the knowledge of what is the APA. However, a user should expect a fair measure of uniformity from one end of a box car to the other.

"Particle size of triple superphosphate, especially run of pile, is less predictable than is the APA content. The answer to the problem may lie in a price schedule varying with the degree of particle size uniformity desired. The practice has begun in charging a premium for granular triple. It could be extended if the user were willing to pay for the extra effort necessary to guarantee a specific size distribution. Again, competition in itself may force changes in production techniques once a given supplier has found a breakthrough for ensuring specific size distribution."

(To Be Continued Next Month)

WORLD MARKET

(*From Page* 18)

paid by a subsidy from the United States. Eventually, the Pakistani government will insist on local formulating only — and later may press for local manufacture of technical materials. For the next five years, however, Pakistan will rely on imports.

Because of the U. S. financial aid and the free distribution of pesticides by the Plant Protection Department, pesticides are used on a much higher percentage of farm land than in India. The organization of the Ministry of Agriculture, with the help of the U. S.-I.C.A., should be able to continue the promotion of good farming practices, including proper use of pesticides.

The Ministry of Agriculture believe they have accomplished a great deal during the past five years in pesticide work. They esti-

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mate this year's pesticide program will bring yield increases of 500,000 tons of food and cash crops with an approximate value of $49 million, and that the program has been almost entirely responsible for increased rice yields of recent years. Control of rice insects is estimated to have resulted in increased yields worth 16 times the cost of treatment.

The world is a big subject. But these examples may present a new slant on the potential market for pesticides *outside* of the United States. Where there has been success, it has come only after hard work, and years of patient waiting by truly dedicated people in these nations. There is much hard work ahead, but the long years of waiting appear to be near an end.

News travels swiftly today, and the examples set in Egypt and Pakistan and a few other nations could very well set off a chain reaction that will result in a greatly-increased, world-wide demand for pesticides. As in India, however, the problems may be too great to solve in a year, or in several years.

But the advantages of the chemical age of agriculture must inevitably be realized wherever there are mouths to feed and bodies to clothe. American manufacturers can lead in supplying these needed materials. What is good for the world is good for American economy. When the time comes, will the U. S. be ready? It could come sooner than any of us may think.★★

DEALER SURVEY

(*From Page* 35)

followed closely by "too little net profit."

The remaining "gripes," in order of importance, were "cost of labor in handling," excessive overhead and storage costs," and "seasonality of sales." A few dealers indicated that they are confronted with the problem of a decline in volume of sales due to a tremendous decrease in acreages devoted to crops and to pasture-land resulting from the federal government's acreage reserve programs.

Information Sources

Dealers were asked from what sources do they receive the most information for their business. The answers to this question indicate that dealers are alert to many sources of information, which they pass on to their customers. Among those most frequently mentioned are; fertilizer manufacturers, agricultural colleges and county agents, the fertilizer inspection service and the various experiment stations, farm magazines and journals, vocational agricultural teachers, soil conservation services, and farmers themselves.

Anticipated Changes

The question was asked "Do you plan any changes in your fertilizer operation in the near future?" A summary of the answers to this question is as follows:

55 per cent planned no changes.

45 per cent planned changes.

About 40 per cent of the dealers anticipating some change intend to decrease the amount of credit business they do.

20 per cent will seek additional information about fertilizer and its use.

12 per cent will decrease the size of their fertilizer operations. The annual average tonnage (materials and mixed goods) for this group is approximately 780 tons each.

10 per cent expect to increase the size of operation. The average quantity of fertilizer ((materials and mixed goods) sold by these dealers was 1360 tons per dealer.

8 per cent were planning to add the use of tank-type applicators to their services.

5 per cent indicate that they will increase discounts on volume and cash sales.

2 per cent plan to erect liquid fertilizer storage facilities.

2 per cent said they would seek additional credit customers.

One-Day Meeting

A final question asked of the dealers was "Would you like Clemson College to hold a one-day meeting or school for dealers, either at one of its experiment stations or a central location in the state?" In response, 71 per cent of the dealers indicated that they would look with favor on such a meeting. Twenty-one per cent did not answer the question, suggesting that

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they at least would be only lukewarm to the idea. However, 8 per cent answered a flat "no."★★

CARBAMATES

(*From Page* 21)

fornia Chemical Company R-5305, has a very similar pattern of activity to the *m*-isopropylphenyl *N*-methylcarbamate and is somewhat less toxic to mammals.

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Zectran [2]/, a product of the Dow Chemical Company, is a more complex substance, 4-dimethylamino-3, 5-xylyl *N*-methylcarbamate. The LD_{50} values to laboratory animals range from 15 to 63 mg. per kg., but its dermal toxicity is low and chronic feeding studies have shown that 100 to 300 p.p.m. in the diet have no effect. Zectran is a contact and stomach poison with moderate residual life, and also has systemic activity. It is very effective when used at 0.25 to 1 lb. to 100 gal. of spray against many pests of deciduous fruits, cotton, vegetables and forage crops, and ornamentals. It is most spectacular in its action against lepidopterous larvae (Shorey, Reynolds, and Anderson, 1961), but is also active against bugs, beetles, maggots, grasshoppers, scale insects, aphids, thrips, mites, snails, and slugs.

An intriguing example of the relationship of chemical structure to activity is the independently developed 4-methylthio-3, 5-xylyl *N*-methylcarbamate, Bayer 37,344. This compound has a somewhat similar spectrum of activity to Zectran and considerable residual action, especially to lepidopterous larvae. This company also has developed *o*-isopropoxyphenyl *N*-methylcarbamate, Bayer 39,007, which has an oral LD_{50} to the rat of 175 to 200 mg. per kg. and is effective at low dosages to flies and mosquitoes, with a rapid knockdown. It also has a good spectrum of effectiveness against cockroaches, mites, aphids and some lepidoptera. Other alkoxyphenyl *N*-methylcarbamates are also active (Metcalf, Fukuto and Winton, 1960).

Many other promising carbamates are under laboratory and field investigation and some of these will doubtless appear as valuable commercial insecticides, with new fields of usefulness.

With any new group of insecticides, the question of acquired resistance by insects is of importance. Two comprehensive investigations of this subject have recently appeared. Moorefield (1960) subjected house flies to 67 generations of intensive selection with *m*-isopropylphenyl *N*-methylcarbamate and produced only 8-fold resistance. However, Georghiou, Metcalf and March (1961) produced more than 50 times resistance to this compound after 22 generations of selection of a strain of house flies which apparently had considerably more genetic heterogeneity. Similar selection with Isolan, however, resulted in only 7 times resistance. It is particularly interesting that the pronounced resistance to *m*-isopropylphenyl *N*-methylcarbamate was reduced to only about 2 times when this compound was applied with the synergist piperonyl butoxide.

One of the interesting features of this group of compounds is the synergism produced by combination with the methylenedioxyphenyl synergists such as piperonyl

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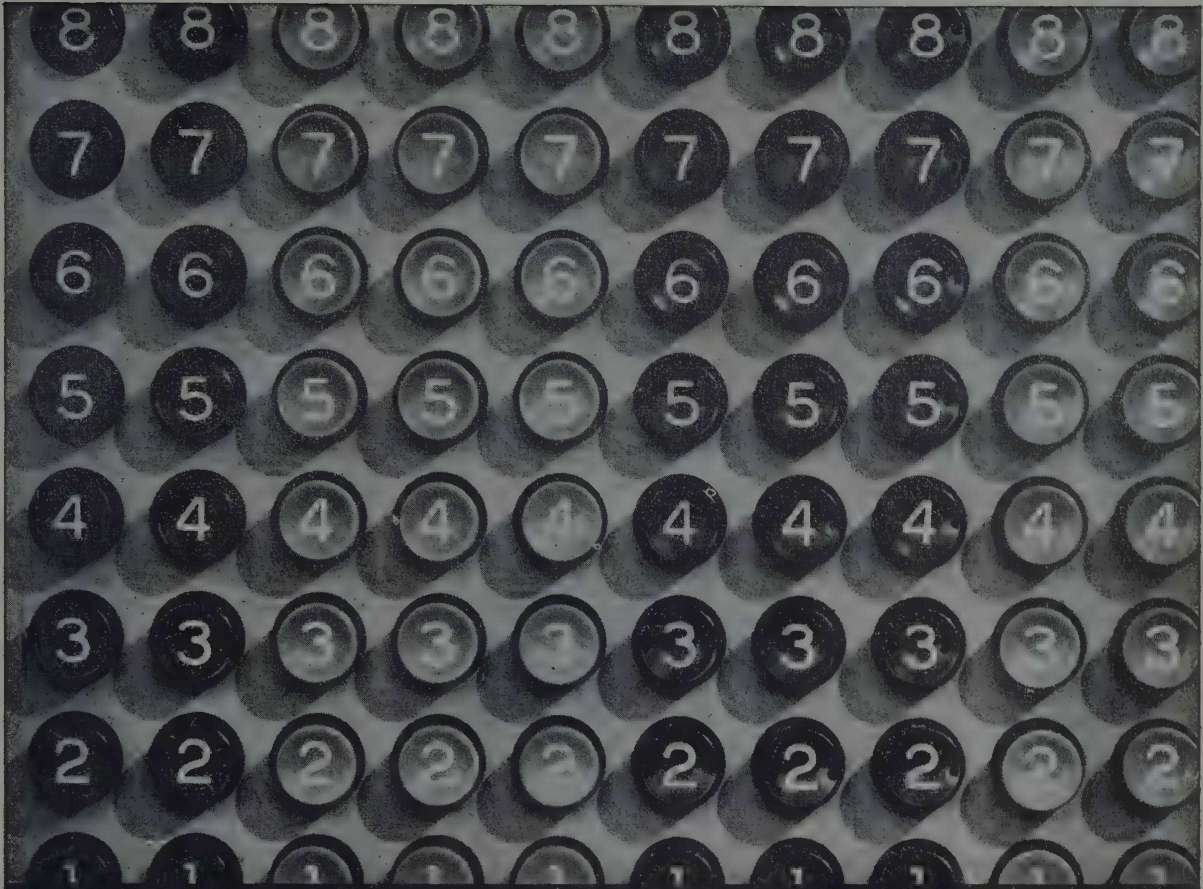

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butoxide, sulfoxide, propyl isome, and sesoxane. Moorefield (1958) showed that these materials could synergize the action of Sevin as much as 30 times against house flies, and to some degree against other insects. Similar synergism occurs with other carbamates, although it appears that in general the more active the compound the less the degree of synergism (Metcalf, Fukuto and Winton 1960). Other materials, such as octachlorodipropyl ether, are effective carbamate synergists (Georghiou and Metcalf, 1961), and this phenomena may ultimately be of value in producing more effective formulations and in overcoming insect resistance to carbamates.★★

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ROUND TABLE

(*From Page* 52)

results in haphazard flow from each orifice depending upon the resistance of the bed surrounding the orifice.

Within the plants of an individual company there can be found a variety of sizes of ammoniators. It is only by understanding the ideas behind the rotary ammoniator that field adaptation for each installation can be made.★★

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PEST ROUNDUP

(*From Page* 59)

latter part of April. Boll weevils were found in most cotton fields of the four lower Rio Grande Valley counties and some activity was noted in the Coastal Bend counties of the State. Wireworms were causing damage in some young cotton fields of Jim Wells, Bee, Live Oak and McMullen Counties. Spider mites and fleahoppers were present in both the Coastal Bend and Valley areas. In western Frio County, many cotton fields were treated for aphids.

In some Yuma County, Arizona, cotton fields about 50 percent of the seedling plants were infested with the beet armyworm. Most larvae were first and second instar, and egg counts were high. Darkling beetles were causing damage to some seedling cotton in central Arizona, and thrips averaged 10-15 per 20 plants in localized areas.

In Gadsden County, Florida, a wireworm was causing concern on approximately 500 acres of tobacco. It is estimated that 2 to 3 percent overall loss to the crop will result. Also in Gadsden County, cutworms were worse on shade grown tobacco than last year.

1960 Loss to Corn Borer

Results of the cooperative State-Federal fall European corn borer survey show the loss of corn grown for grain utilization attributed to that insect in 1960 to be an estimated 102,991,000 bushels. The value of the crop lost, based on the season average prices received by farmers, is $96,085,000.

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The monetary loss in 1959 was almost 72 million dollars, but, in 1949, the corn borer dollar loss figure was almost 350 million dollars.★★

ITALIAN PRODUCERS

(*From Page* 41)

Fauser-Montecatini process have a production capacity that has been estimated at 1,000,000 tons annually, accounting for 48 per cent of the total world production.

With the construction of the Campofranco plant, in Sicily, Montecatini recently joined the ranks of world producers of 50-52 per cent potassium sulfate. This plant is linked to the San Cataldo mine by an overhead cableway 11 miles in length, capable of carrying 3,000 metric tons of Kalinite daily. The present annual capacity of this plant is 150,000 tons of potassium sulfate containing 50 to 52 per cent K_2O. 40,000 tons are of potassium-magnesium sulfate, equivalent of 65,000 tons of K_2O, the latter figure equaling Italy's present total consumption. The Campofranco plant was designed for an eventual doubling of production, to be effected in accordance with consumption requirements.

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ARMOUR PLANT

(*From Page* 23)

pleted in 1962, the chemical industries part of the Armour organization will for the first time represent more investment than the total for abattoirs and meat-producing facilities of the parent Chicago firm.

Construction of the Cherokee nitrogen plant is being financed by the town of Cherokee under the terms of a $25,000,000 bond issue, said to be the largest of its kind in the nation. When completed, the plant will be leased to and operated by Armour. It will be the largest facility of its kind in the country.★★

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4—Davenport #2A dewatering presses.
5—Buflovak 42″ x 120″ dbl. drum dryers.
3—Shriver 48″ C. I. filter presses, 50 ch.
2—Allis-Chalmers Inter-plane grinders.
8—Allis-Chalmers degerminators.

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AG CHEM

TALE ENDS

JAPANESE scientists report that Ohya rock, a kind of liparitic tuff and the building material of Frank Lloyd Wright's Imperial Hotel in Tokyo, is capable of suppressing the uptake of radioactive strontium by plants. Furthermore, the use of Ohya stone in fertilizer pellets is said to prevent phosphoric acid fixation by the soil. The Japanese research team reports that, where Ohya powder is incorporated with a chemical fertilizer, increases in yield of 5 to 15 per cent have been observed. Farmers concerned about atomic fallout, therefore, can rest assured if their fertilizer is prepared with Ohya rock as a constituent. Their harvests will improve and the build-up of Ohya stone in their fields will reduce any chances of atomic contamination.

AC

Readers of our May issue were interested to hear of the retirement of John H. Kennedy as assistant to the vice president of Stauffer's agricultural chemicals division and of his plans to manage Bob Zipse's East Lake Camps in Oakland, Maine. John Kennedy and Bob Zipse are well-known names in the ag chem industry and anyone interested in boating, hunting, fishing, etc. during their vacation can count on a big welcome this summer at the East Lake Camps. Located on the headwaters of the Belgrade chain of lakes, East Lake features small-mouth bass, boating, swimming, hunting, golf, and relaxation.

A TYPICAL AGRICULTURAL CHEMICALS SUBSCRIBER TELLS

Why He Reads Agricultural Chemicals

WILLIAM N. ROEMER
Custom Applicator
Bowling Green, Ky.

I am interested in all new insecticide, herbicide, and fertilizer developments and find that AGRICULTURAL CHEMICALS *helps me keep up-to-date with the industry's products. Although I always read the Custom Applicator section first, the entire magazine is of interest because the many new chemicals that become available throughout the year are covered fully in the magazine. A thorough background on new sprays and new spraying methods helps an applicator to keep costs down.*

Mr. Roemer is a custom sprayer-dealer whose operations are centered in the Bowling Green area of Kentucky. In support of these operations, he conducts a continuing series of experimental plots to study the application methods that respond best to the soils and climate of his area. Mr. Roemer has been a custom sprayer since 1948.

— Leader in the Field —

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AC

The whodunit influence has extended to the Florida Department of Agriculture, where a movie entitled "Insect Lineup" is being produced. Harold Denmark, chief entomologist, is shown with some of the insect specimens collected for use in the movie. Soon to be completed by the Division of Plant Industry, Gainesville, Fla., the film is expected to be of considerable aid in the identification of insects.

AC

A bill currently being considered by the Oregon House of Representatives calls for the establishment of a special "plant damage research program" to determine what, if any, damage is caused to agricultural crops from the use of herbicides. The study is to be conducted through Oregon State University. Of particular interest to manufacturers of herbicides sold in Oregon will be the proposed method for financing the study. Under terms of the bill, a tax is to be imposed on each pound of 2,4-D and 2,4,5-T sold in Oregon between July 1, 1961 and July 1, 1963. The herbicide industry, thus, will provide funds to finance the study to determine what damage to crops is caused by 2,4-D and 2,4,5-T.

AC

An advertisement recently placed by Stauffer Chemical Company in agricultural papers and magazines effectively stresses the importance of reading the label before using a pesticide. Entitled "The Most Important 4 Minutes in Pest Control," the ad points out that more economical pest control and greater personal and crop safety will result if users of pesticides on farms will read the labels carefully and follow their directions exactly. The ad also makes the point that "an extra spoonful for the pot" is not a good rule to follow when mixing chemicals.

AC

An indication that the cranberry industry still is paying for the 1959 mistake of a few growers who ignored the label and applied herbicides to their cranberries before harvest, is the report that cranberry sauce pack fell 39.3 per cent during 1960 to 4.2 million cases.

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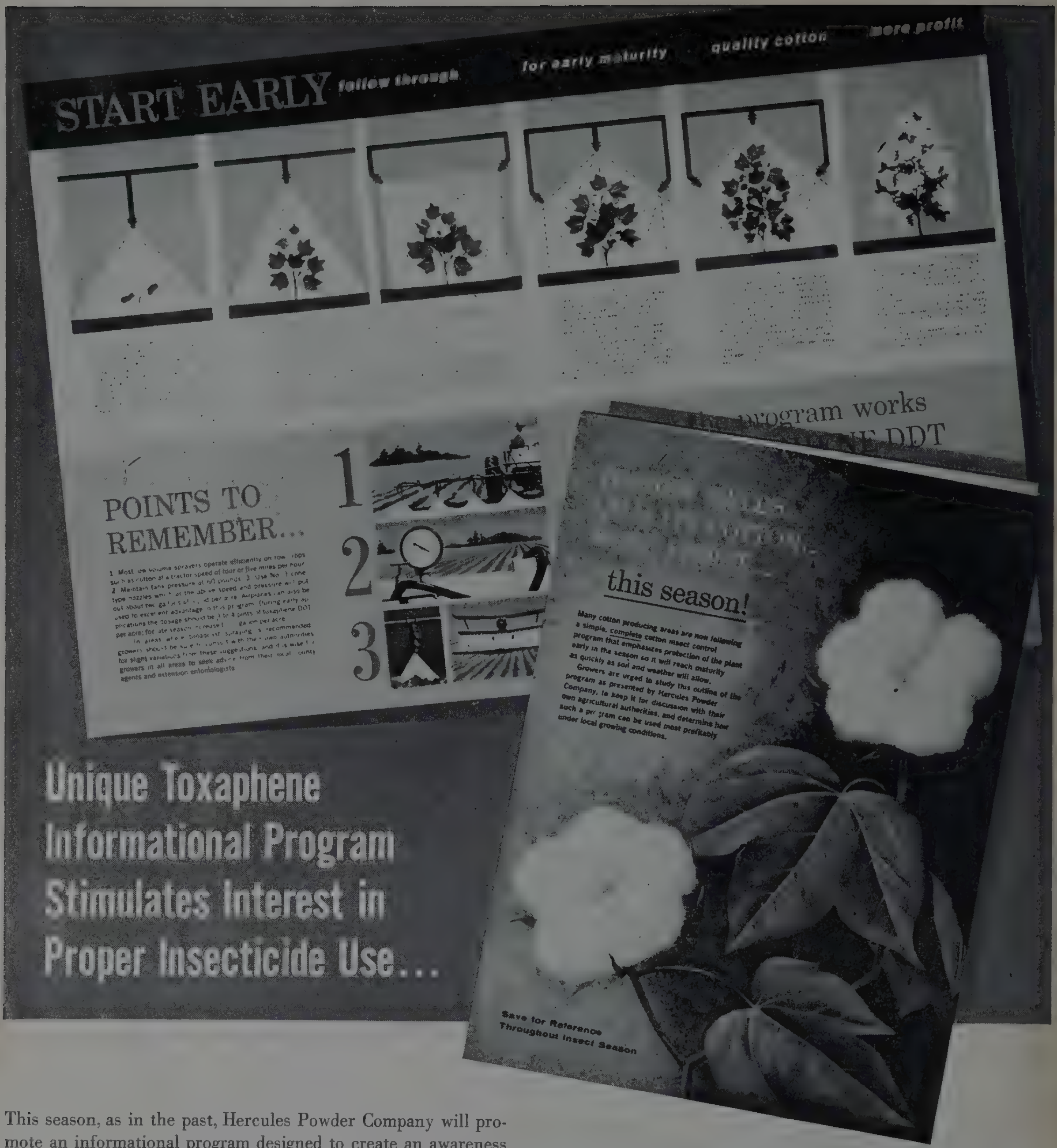
START EARLY
follow through
for early maturity
quality cotton
more profit
POINTS TO REMEMBER...
1
2
3
program works
DDT
this season!
Save for Reference Throughout Insect Season
Unique Toxaphene Informational Program Stimulates Interest in Proper Insecticide Use...

Many cotton producing areas are now following a simple, complete cotton insect control program that emphasizes protection of the plant early in the season so it will reach maturity as quickly as soil and weather will allow. Growers are urged to study this outline of the program as presented by Hercules Powder Company, to keep it for discussion with their own agricultural authorities, and determine how such a program can be used most profitably under local growing conditions.

This season, as in the past, Hercules Powder Company will promote an informational program designed to create an awareness of the need for better insect pest control. One of the highlights of the 1961 program is a four-page, four-color insert running in leading Cotton Belt publications, outlining a planned, complete program of cotton insect control with toxaphene-DDT, the insecticide combination with "synergistic action."

Toxaphene promotion with seasonal messages will also appear in local farm publications, newspapers, and on local radio and TV stations and other media. Hercules will also continue its long-time sponsorship of leading radio and TV farm directors in the Cotton Belt and in other prime toxaphene markets.

Millions of farmers will have a new interest in toxaphene and the toxaphene-DDT combination. The Hercules informational program will help them get the most from their insecticide dollar—build more confidence in insecticides.

A copy of the special Cotton Belt insert "Higher Yields, Quality Cotton, More Profit" is available on request. Write to:

TOXAPHENE

Agricultural Chemicals Division
HERCULES POWDER COMPANY
Hercules Tower, 910 Market Street
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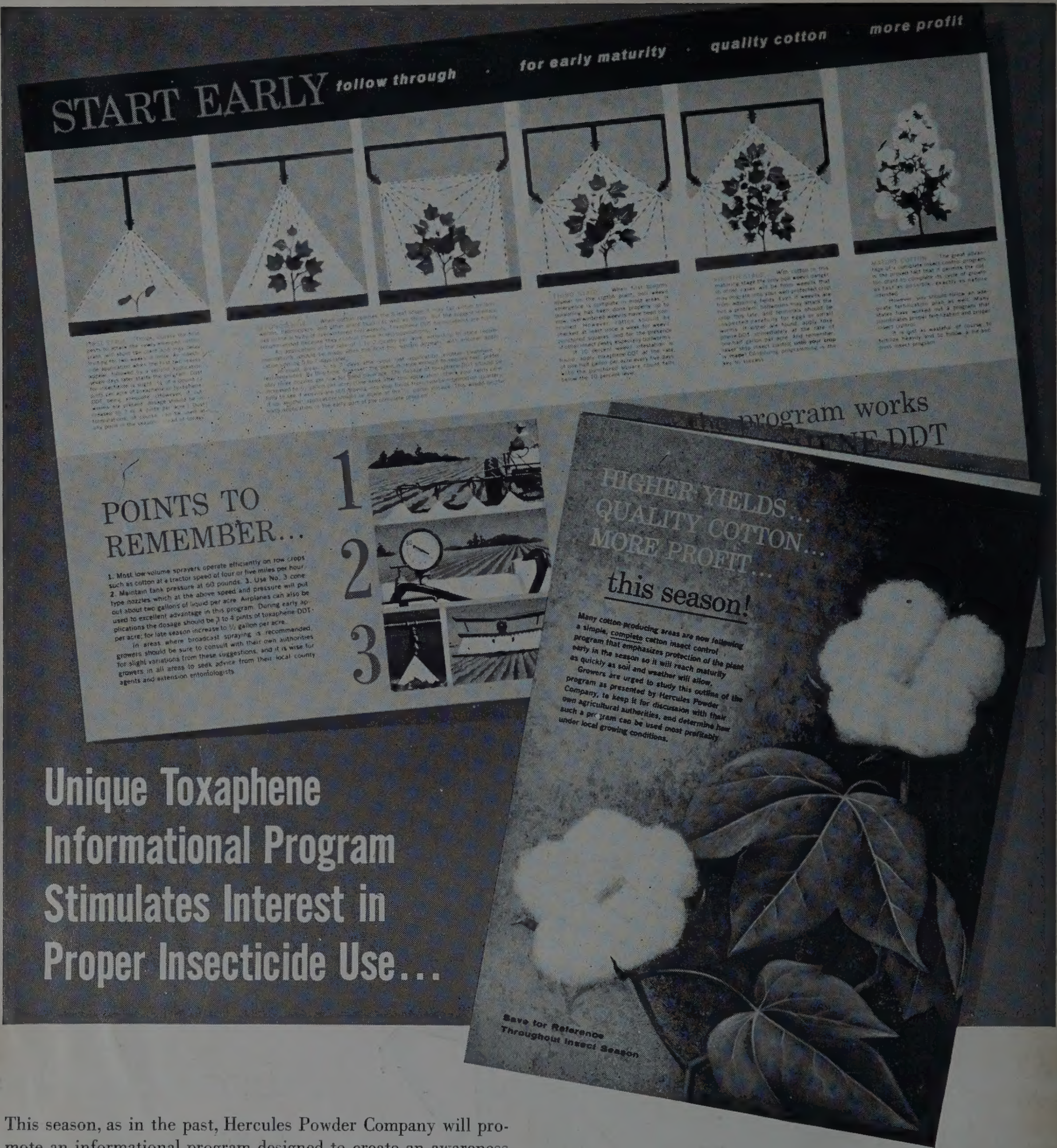

POINTS TO REMEMBER...

1. Most low-volume sprayers operate efficiently on row crops such as cotton at a tractor speed of four or five miles per hour. 2. Maintain tank pressure at 60 pounds. 3. Use No. 3 cone type nozzles which at the above speed and pressure will put out about two gallons of liquid per acre. Airplanes can also be used to excellent advantage in this program. During early applications the dosage should be 3 to 4 pints of toxaphene-DDT per acre; for late season increase to ½ gallon per acre.

In areas where broadcast spraying is recommended, growers should be sure to consult with their own authorities for slight variations from these suggestions, and it is wise for growers in all areas to seek advice from their local county agents and extension entomologists.

HIGHER YIELDS...
QUALITY COTTON...
MORE PROFIT...
this season!

Many cotton-producing areas are now following a simple, complete cotton insect control program that emphasizes protection of the plant early in the season so it will reach maturity as quickly as soil and weather will allow.

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Unique Toxaphene Informational Program Stimulates Interest in Proper Insecticide Use...

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